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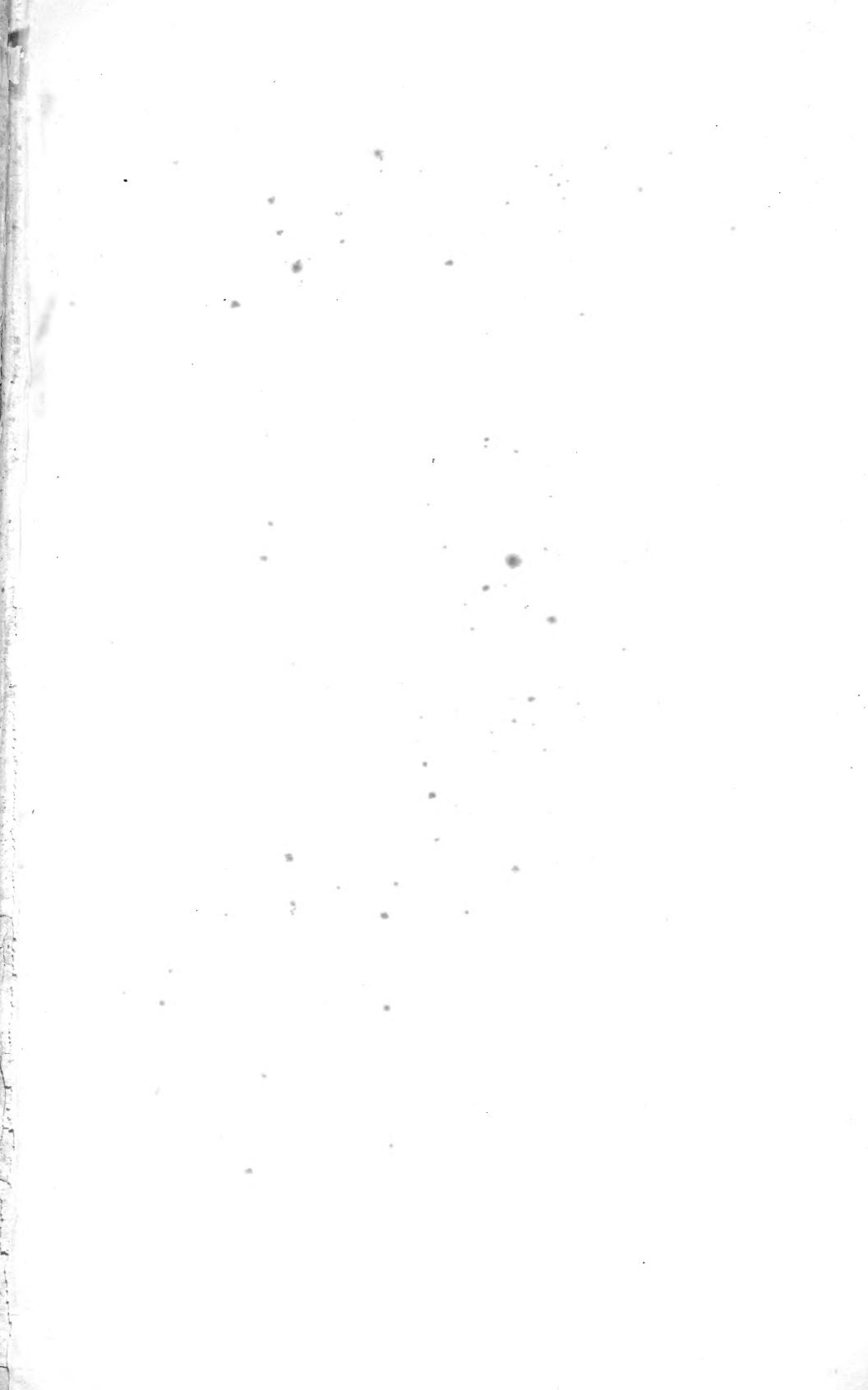
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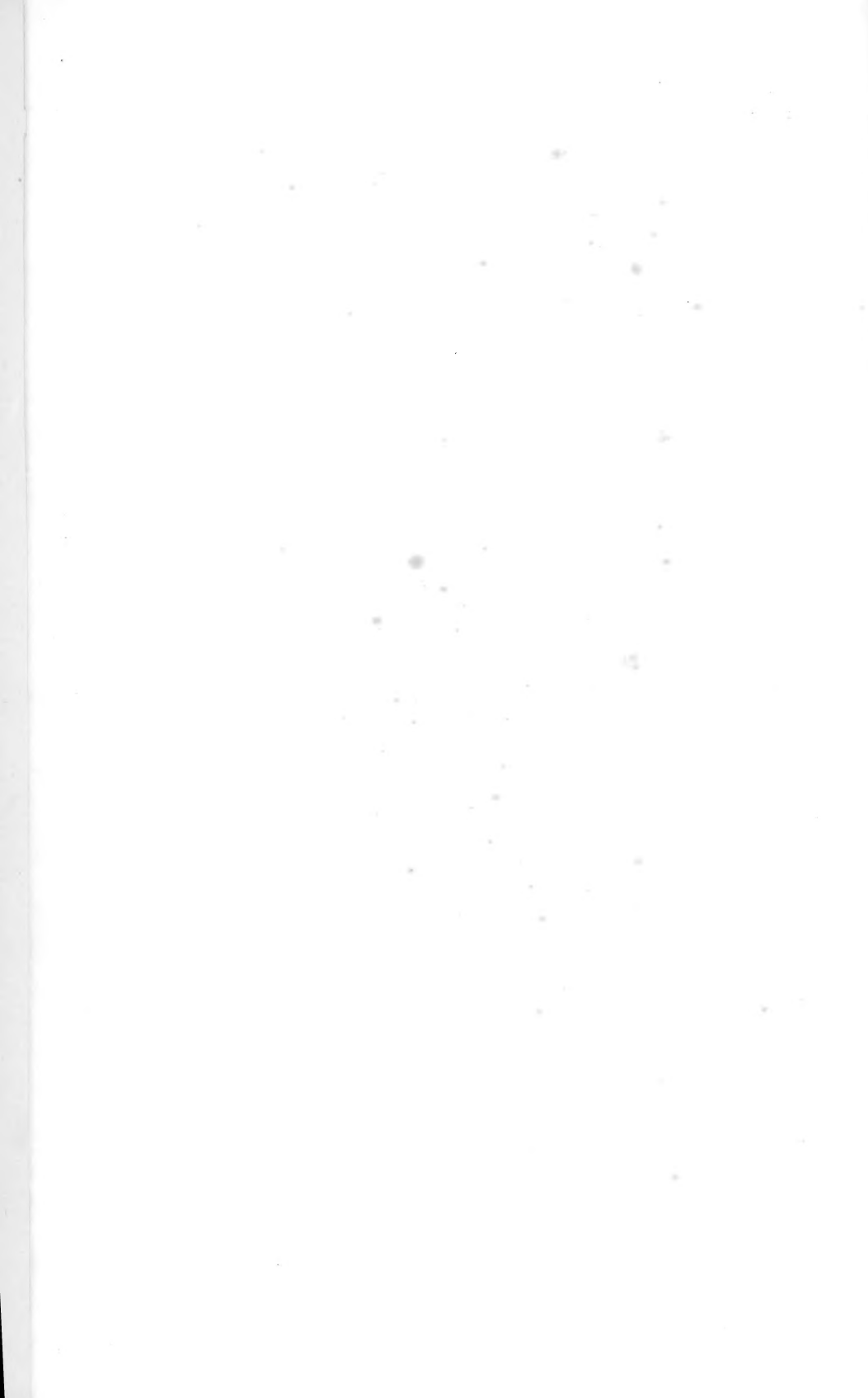
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OSTRICHES AND OSTRICH FARMING.

OPINIONS OF THE PRESS.

"No pains have been spared in consulting all the authorities who have treated of the Ostrich and its allies. Hence the production of a very readable volume.

"This book, it must not be forgotten, is not only a contribution to natural history—it aims at a distinctly practical object."—*Saturday Review*.

"A very carefully compiled monograph of one of the most interesting groups of birds, in which has been incorporated all the most recent information as to their habits and distribution, with references to the best authorities on their structure and affinities.

"The authors are to be congratulated, not only on their own work, but on the assistance they have received from others, especially from the British Consuls in various parts of Africa, whose reports form a valuable appendix."—*The Academy*.

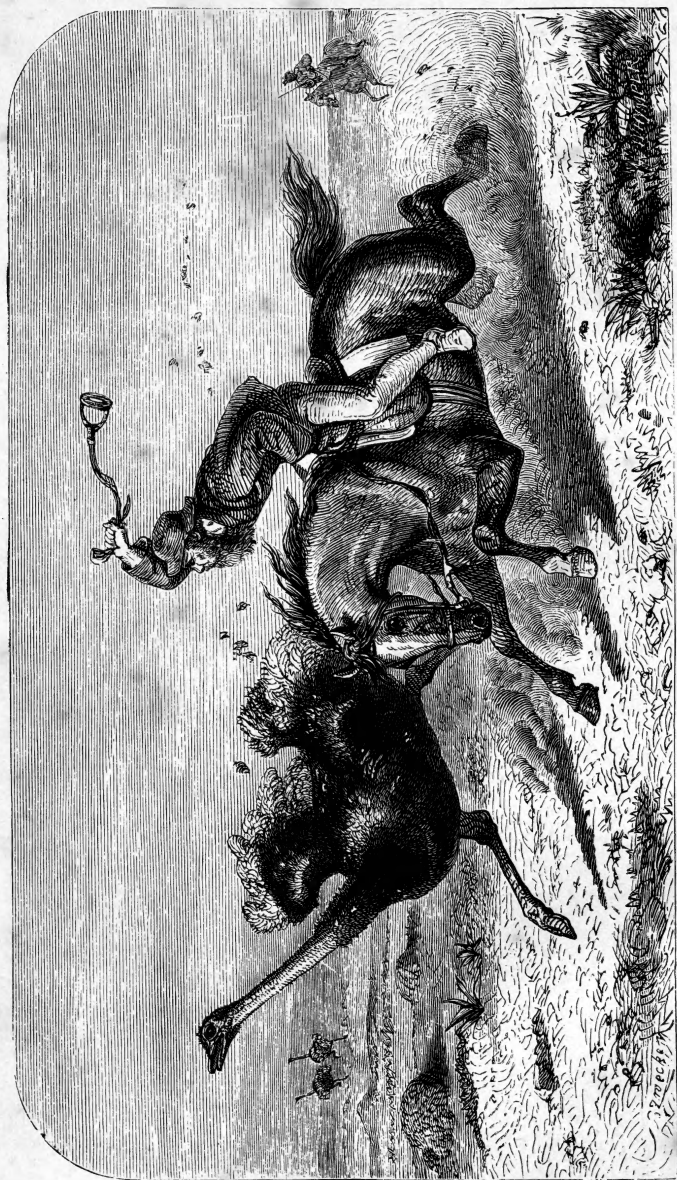
"The history of the Ostrich, and its distribution in times past and present, is very exhaustively compiled. Mr. de Mosenthal's portion of the work is confined to the practical Ostrich-farming, and seems to be extremely well worked out, giving a history of a development of the pursuit from its first commencement."—*Nature*.

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"'Ostriches and Ostrich-Farming' affords the most complete information attainable on the subject, and the carefully-written monograph of the Ostrich family is a valuable addition to our knowledge."—*Pall Mall Gazette*.

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"Full and interesting details are given of the Ostrich proper, of the several species of Rhea and Cassowary, and of the Mooruk, Emu, and Apteryx. The authorities consulted have been most varied, and the materials amassed have been arranged in regular order, and exhibited in a clear and accurate form."—*The Queen*.



AN OSTRICH HUNT.

Frontispiece.

OSTRICHES

AND

OSTRICH FARMING.

BY

JULIUS DE MOSENTHAL,

CONSUL-GENERAL OF THE ORANGE FREE STATE FOR FRANCE; LATE MEMBER OF THE
LEGISLATIVE COUNCIL OF THE CAPE OF GOOD HOPE, ETC. ETC. ETC.

AND

JAMES EDMUND HARTING,

FELLOW OF THE LINNEAN SOCIETY; FELLOW OF THE ZOOLOGICAL SOCIETY;
MEMBER OF THE BRITISH ORNITHOLOGISTS' UNION, ETC. ETC. ETC.

WITH ILLUSTRATIONS.

New Edition.

LONDON:

TRÜBNER & CO., LUDGATE HILL.

1879.

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Balcony

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PREFACE TO THE SECOND EDITION.

THE favourable reception accorded to this work, both at home and abroad, and the marked recognition of its utility by the French "Société d'Acclimatation," has encouraged the hope that a second edition may be as favourably received; the more so if we give here, as we propose to do, a *resumé* of such fresh information of importance as has reached us in connection with the subject since the appearance of our first edition.

That the interest taken in "Ostrich-Farming" has in no degree abated, but, on the contrary, considerably increased, may be inferred from the official returns of the annual value of ostrich feathers exported from the Cape. The return for 1878 is not yet before us, but from the subjoined table it will be seen that during the year 1877 the value of exported feathers from South Africa amounted in round numbers to £420,000, or about double what it was just prior to the publication of the first edition of this work, thus verifying the anticipations on this point which we then ventured to express:—

Export in 1877.	Quantity.	Value.
From Port Elizabeth	42,208 lbs.	£265,407
„ Cape Town	19,946 „	104,885
„ Natal and Mosel Bay . . .	5,000 „	50,000
	67,154 lbs.	£420,292

The fluctuation here observable in the average value

per pound arises, as will be readily understood, from variation in quality, the state of the markets, of the season, and other causes.

To give some idea of the prices lately realised at colonial sales for immediate export, we may quote a letter dated "Port Elizabeth, 12th November 1878," which ran as follows :—

"A very large quantity of ostrich feathers was offered at public auction to-day, requisitions having been sent in for one hundred and four tables, of which ninety-four were disposed of by the time the market closed. The exhibit included a larger proportion than usual of white feathers, and the quality, on the whole, was above the average. As might have been expected from the character of the latest intelligence from home, prices were lower, especially of white feathers, and of other descriptions also, but the decline was not so marked as might have been anticipated. For a very fine lot of about 2 lbs. prime white, selected feathers, long, and of full plumage, Messrs. Hansen & Schrader obtained £42, 10s. per lb., the maximum price given to-day. Mr. John Holland also sold some very superior feathers from his flock of birds at Cuyler Manor. Among them were the pluckings of three Barbary ostriches, which attracted considerable attention.¹ These feathers were of peculiar shape, not so broad as the ordinary feathers, but of rich plumage and very full at the tips, almost resembling a double flower. For his prime whites Mr. Holland realised £40 per lb. Other lots of superior prime whites brought £36 to £38, 10s. per lb. For light long coloured, as high as £25, 5s. per lb. was given, and for good white tails £13 per lb. was the highest price obtained. Ordinary long blacks brought as high as £13, 10s. per lb., and a small lot of extra superior, quite an exceptional sample, realised the fancy price of £24 per lb. Drabs and young birds' feathers were also weaker, but there was nothing under this head requiring special notice. Messrs. A. C. Stewart & Co. sold a large parcel of wild feathers from the interior, for which good prices were obtained."

¹ These were birds shipped to the Cape from Tripoli in the spring of 1876 by Mr. de Mosenthal, and to which we shall have occasion to allude further on.

At the monthly public sales in London (Mincing Lane), it not unfrequently happens that two hundred cases of Cape ostrich feathers of the aggregate value of £80,000 to £100,000 are all sold, and often with a rise of five or ten per cent.; showing that increased production is not always followed by diminished prices. How long this state of things will exist no one of course can foresee, but should the present demand continue, there is not likely to be any failure of supply.¹

The Arabs in various parts of the Sahara bordering Egypt and the Barbary states are now apparently engaged in ostrich-farming, but whether they rear the young bird from the egg by means of incubators, or merely capture and confine the old birds and permit them to hatch their own eggs, we are at present unable to say; for they preserve great reticence about their proceedings, and keep their secrets as only Orientals can do when their pockets are concerned. Indeed, we should be entirely ignorant of the fact of this secret enterprise were it not for the significant circumstance that, out of the large consignments of feathers from Cairo and Tripoli, more than half the quantity received is the produce of domesticated birds; the difference between feathers from wild and tame birds being, as we have already remarked (p. 224), immediately perceptible to the connoisseur.

¹ As an indication of the spread of ostrich-farming in the colonies, it may be mentioned that a case of ostrich feathers from New South Wales recently made its appearance in the London market. The feathers were considered to be of a fair average quality, although the sample was small. In our opinion, the chief obstacle to the success of ostrich-farming in this colony is the uncongenial nature of the soil; the luxuriant grass of New South Wales being unsuited to birds which are accustomed to thrive on the parched Karoo veldt of South Africa.

In April 1878, at a general meeting in Paris of the "Chambre Syndicale," a committee was appointed under the presidency of M. Hiéland to report on the best means of developing and encouraging ostrich-farming in Algeria and other French colonies.

The first step of this committee was to collect all the documentary evidence they could obtain on the subject, and to extract therefrom all the information available on the natural facilities likely to be afforded those who might care to embark in ostrich-farming for the sake of the feathers.¹ The next step was to ascertain the best means of encouraging, or rather of creating and developing, this branch of industry in the French colonies, more particularly in Algeria. Such indifference was found to prevail on the subject, that the Acclimatisation Society at Hamma had been obliged to impose a check on the reproduction of their ostriches, the demand for these birds not being equal to the supply. Two individuals, however, were found to be persevering with success in the neighbourhood of Algiers, namely, an English lady, the wife of a French advocate, and M. le Commandant Crépu at Dajà, in the province of Oran. It was ascertained that no feathers from *wild* ostriches were now exported from Algeria, the indiscriminate slaughter of the birds by so-called "sportsmen" having resulted either in their extermination, or in their being driven far into the interior of Africa. Even the eggs brought in by the Arabs, and used for various fancy ornaments, were said to be getting every year scarcer and dearer.

From the statistics obtained on these and other

¹ The committee acknowledge their indebtedness to the present work for a great number of valuable statistics.

points in connection with the subject, the committee prepared a report which was read by the president, M. Hiélard, at a general meeting of the "Chambre Syndicale" held in Paris on the 9th January 1879.¹ After detailing at some length the history and development of ostrich-farming, the report was directed to a consideration of the conditions most essential to the establishment and management of a model ostrich-farm which it was proposed should be established in Algeria. The chief obstacle to success was stated to be the difficulty which the committee experienced in purchasing a sufficient number of birds for stock, and on this account it was thought by some that there would be a greater chance of success if the farm were situated in Egypt instead of in Algeria, since there would be more facilities there for obtaining what would be required. It was admitted, however, that the thirty-three ostriches which had already been purchased in Algeria might form a sufficient stud to commence with. As regards soil and climate, the committee were of opinion that both in Algeria and Senegal the conditions were most favourable, and that there was no reason why ostrich-farming, if properly managed, should not succeed there as well as it had been found to do in the Cape Colony and in Natal. The report concluded by recommending the formation of a society, under the auspices of the "Chambre Syndicale," which should have for its object the dissemination of useful practical hints for the development and improvement of ostrich-farming, and the distribution of prizes for the best results, or rather for such individual efforts as should contribute most effica-

¹ This report will be found printed at length in "L'Union Nationale du Commerce et de l'Industrie" of the 3d February 1879.

ciously to produce them. As an alternative it was suggested that this task might be undertaken by the "Chambre Syndicale" itself, which might thus become a "Société d'encouragement" authorised to collect the subscriptions necessary for carrying out the object in view. The meeting unanimously decided to intrust the matter entirely to the "Chambre Syndicale."

In the course of the discussion which followed the reading of the report, it was stated by M. Laloue that the efforts of those members of the committee who had proceeded to Algeria for the purpose of starting the project had been so far successful that, with the co-operation and assistance of the Governor-General of Algeria and an enthusiastic resident proprietor, they had already acquired and enclosed a favourably situated tract of land as an ostrich farm, and stocked it with thirty-three birds. These preliminary steps are considered so satisfactory that the best results are anticipated.

In South Africa considerable investments continue to be made in the purchase of land and stock for ostrich-farms, and a noticeable feature in the import list of the South African ports is the number of cargoes of maize or Indian-corn (locally termed mealies), which is imported chiefly for consumption by the numerous flocks of ostriches which are now maintained upon the various farms. This is particularly the case in the neighbourhood of Port Elizabeth and Grahamstown, where enterprise of this kind has received so much encouragement that a writer in the "Grahamstown Journal" has recently reported that a pair of ostriches there are worth £500 a year to their owner; not of course for the value of their feathers alone, but for the prices realised in addition by the sale of their progeny.

Well-bred young birds from two to four months old now fetch from £8 to £12 each; those two years old from £25 each; five years old from £35; and first-class breeding birds from £60 to £120. These are the latest prices quoted by Messrs. Berkeley & Fitzgerald of Grave Street, Cape Town, who act as agents for the principal ostrich farmers in the Western Province, and whose London agent is Mr. Finlay of 80A Fenchurch Street.

Incubators have been brought to such a state of perfection as to make the hatching of all fertile eggs well-nigh a certainty, and render it undesirable to run the risk of accidents by leaving them to the care of the parent bird. Since our description appeared of those in use in 1876, several new models have been designed and introduced. Amongst these may be mentioned that of Mr. Furniss, the tanks of which are constructed to hold about six gallons of hot water, which are filled morning and evening, and in which, it is said, the temperature never varies more than one or two degrees at the utmost; the cost being £15.¹ Halsted's "American Ostrich Incubator" is well spoken of as ensuring an even distribution of heat, applied to the *top* of the eggs, at an invariable temperature with good ventilation, so that all foul air in the egg-drawer is obviated. A regulator can be set so as to open or close the ventilator, and increase or decrease the flame of the lamp within a variation of two degrees. Thus the heat is constantly under control, and the incubator may be left for a whole day with the assurance that the heat cannot get high enough to injure the eggs.²

¹ Agents, Messrs. Berkeley & Fitzgerald, 8 Grave Street, Cape Town.

² Agents, Messrs. Van der Byl & Co., 35 St. George's Street, Cape Town.

In Christy's Hydro-Incubator neither gas nor lamp is required, the working power consisting solely of a cistern of hot water enclosed in a packing of non-conducting material. It holds fifty eggs, and costs £9, 10s.¹

That ostriches, like other animals, should have their diseases is only what might be expected; the treatment of these, however, is but imperfectly understood. In the majority of cases which have terminated fatally, death appears to have resulted from disease of the lungs, the cause of which has not been satisfactorily ascertained. Parasites, both external and internal, exist; of the former class, two species, both suctorial, have been detected; but although they produce the usual discomfort and irritation, they do not, so far as has been observed, cause any direct injury to the feathers. Apparently no application of "insect powder" avails, but a little bran mixed with the food has been found beneficial, as promoting a healthy condition of skin. Of the internal parasites, an intestinal worm, known as the "wire-worm," from its form and hardness, is the most troublesome, and the only one, it would seem, that proves fatal. The antidote is castor-oil.

A singular defect in the feathers, well known to those who have kept hawks, and called by them "hunger-traces," is observable also in the ostrich, but only in tame birds. It appears as a line of imperfection across the web of each feather, chiefly in those of the wings; while on the shaft the mark may be not only seen, but felt as a slightly projecting ridge. The injury from this cause is sometimes such as to occasion the feathers to

¹ Messrs. Christy & Co., 155 Fenchurch Street, London, E.C.

break off at the "hunger-traces," and it is not improbable that the mark seen on the web is in fact owing to the breaking off of all the fine fibres of the web in the line of the trace.¹

Ostrich feathers thus marked are said to be "bitten," a term which, like the French equivalent—" *coup de bec* "—conveys the erroneous idea that the injury is caused by the bird's own beak, or by that of its companions. Now, it is well known to falconers that in hawks this defect arises from the want of proper and sufficient food (hence the term "hunger-trace") at some period during the growth of the feathers; and there can be little doubt that this is so in the case of the ostrich. It occurs most frequently in time of drought, when the birds are unable to procure their natural diet, and have to be fed on maize or such other dry food as is most easily obtainable. This produces an unhealthy condition of skin, and experience has shown that the remedy lies in the cultivation of Prickly Comfr y, which not only withstands drought well, but furnishes the birds with excellent food well suited to their requirements.

With the exception of a few articles in English and foreign journals, little worth notice has been published in connection with ostrich-farming since the appearance of our first edition. We may briefly refer, however, to Mr. Anthony Trollope's remarks on the subject in the first volume of his work on South Africa, and to a pamphlet by Mr. Gilbert Smith, late of Her Majesty's Customs, Cape Colony.

In 1877 Mr. Trollope paid a visit to Mr. Douglas's ostrich-farm at Hilton near Grahamstown, and his

¹ Sebright, Observations on Hawking, pp. 5, 6.

observations are chiefly confined to a narration of what he saw there. Being doubtless unaware that we had already given an account of this farm in much greater detail, his remarks are little more than a repetition in other words of what we had already published. It is gratifying, however, to find in Mr. Trollope's volumes much that we had written confirmed by the testimony of so competent an observer. He puts the matter very fairly when he says—"I have heard that 50 per cent. per annum on the capital has been not uncommonly made. But I have heard also that all the capital invested has been not unfrequently lost. It must be regarded as a precarious business, and one which requires special adaptation in the person who conducts it."

In the "*Illustrated London News*" of March 30th, 1878, appeared an article on ostrich-farming, in which Mr. Trollope's remarks were largely quoted, and illustrated by some very characteristic engravings from photographs taken on Mr. Douglas's farm near Grahamstown.

These engravings deserve notice, since they convey to the mind, so much more vividly than any written description can do, a good idea of the varied incidents which daily occur in the routine of an ostrich-farm.

Mr. Gilbert Smith's pamphlet above referred to,¹ records the result of his personal observation of ostriches and ostrich-farms in the districts of Swellendam and Bredasdorp; and as he has for many years paid considerable attention to the habits of the ostrich and its treatment in confinement, his hints to in-

¹ Published by Messrs. Berkeley & Fitzgerald, the Colonial agents before mentioned.

tending speculators will no doubt be found useful. We do not perceive, however, any point of importance in this pamphlet which we had not already discussed, and in greater detail.

Certain critics have taken exception to our report that three crops of feathers may be taken from the same bird in two years; and the ground of exception stated is, that as an ostrich moults but once a year, it could not be possible to obtain more than two crops of feathers within the time stated. The critics, however, overlooked the fact that the birds are not *denuded* each time, but a selection only of the best feathers is made. On this point we are confirmed by Mr. Kinnear of Beaufort West, Mr. Atherstone of the Zuurberg near Grahamstown, Mr. Trollope, Mr. Gilbert Smith, and others. As the latest writer on the subject, we may quote Mr. Smith's remarks on this point. "You can pluck an ostrich," he says, "every seven months, keeping date thereof. I prefer cutting the long wing and tail feathers—say about an inch from the root—as plucking out the feather forcibly is a cruel process. One month afterwards you can pluck out the stems with pincers, as they will be ripe and ready for shedding to make room for the next crop of feathers."

At page 232 we have referred to the shipment by Mr. de Mosenthal, in the spring of 1876, of two pairs of Barbary ostriches from Tripoli to Marseilles, and thence *viâ* London to the Cape, for the purpose of an experiment in the improvement of stock. These birds reached their destination in safety, and are now in fine health and condition at a farm called "Cuyler Manor," near Port Elizabeth. Although used for breeding purposes, they are kept apart from the Cape birds; and from the

quality of the feathers they have yielded, it would seem that their plumage has in no way deteriorated by their removal from North to South Africa.

In the foregoing pages, it will be observed, our remarks have had reference to the second part of our book, or that which deals exclusively with ostrich-farming. To the information contained in the first part we have but little to add, beyond directing attention to the valuable remarks by Professor Newton on the nomenclature of the groups of *Ratitæ*¹ and the continuation of Professor Mivart's important papers in the "Transactions of the Zoological Society" on the Axial Skeleton of the *Struthionidæ*.

Within the past two years, two or three specimens of Cassowary from different parts of New Guinea have been described as new species, but whether they are really so is doubtful. We have already expressed our misgivings as to the specific validity of *Casuarus westermanni*, Sclater (see p. 119), which is apparently identical with *C. papuanus*, Rosenberg (p. 118); and with these probably must be associated the bird recently described by Dr. Meyer, so far as can be judged by his description.²

From the peculiar conformation of the neck-wattle, *Casuarus tricarunculatus*, described by Dr. Beccari,³ from Salwatti, New Guinea, appears to possess a distinctive character; but *Casuarus Edwardsi*, of which a description with coloured figure of the head and neck has been lately given by our friend M. Oustalet,⁴ is

¹ Ann. Nat. Hist. (4), vol. xx. p. 499.

² "Ueber einen Papuanischen Kasuar im Dresdner Museum," Journ. für Orn., 1878, p. 199.

³ Ann. Mus. Génov., vii. p. 717.

⁴ Proc. Zool. Soc., 1878, p. 389.

probably the adult of *Casuarus papuanus*.¹ Great variation apparently exists in the shape and size of the casque, as well as in the size of the neck-wattle and the colour of the naked parts, all which differences are no doubt dependent upon age, sex, and season; thus rendering it very difficult to pronounce with certainty upon the species of any but adult birds.

On perusing the various reviews which have appeared of "Ostriches and Ostrich-Farming," it is satisfactory to find that only one contained any unfriendly criticism. In the journal referred to, the reviewer was pleased to say that the larger portion of our work would "scarcely prove of much service," the matter which it contains being "chiefly compiled from books which are quite amongst the most accessible of all ornithological literature."

Unmindful of the fact that some of the most useful books ever published have been compilations, the reviewer omitted to state (as he might easily have done from the list furnished him) that the number of works and articles quoted or referred to by us amounted to over two hundred, and that in one of the "most accessible" libraries in London, that of the Zoological Society, more than thirty of these were not to be found!

We should not have thought it worth while to notice these remarks, were it not for the fact that the journal in which they appeared was professedly established for the *encouragement* of ornithological science. Less encouragement than this we could scarcely have received: fortunately, as events have shown, we could afford to dispense with it.

¹ Cf. "The Ibis," 1878, p. 481; and 1879, pp. 96 and 105.



PREFACE.

AT the late Vienna Exhibition, Mr. de Mosenthal, in his capacity of Commissioner for the South African Colonies, exhibited a complete assortment of ostrich feathers supplied from tame birds, together with a model of an artificial incubator. This circumstance gave rise to so many applications for information on the subject of ostrich-farming, as to suggest the desirability of publishing some account of this new industry which should furnish answers to the various inquiries made of him.

It was at first intended to deal solely with the history, development, and present condition of ostrich-farming, but on consideration it was thought that such a treatise would be scarcely complete without some reference to the natural history of the ostrich and its allies, more especially as it is not to the African bird alone that the world of fashion is indebted for the so-called "ostrich feathers."

The opportunity seemed a good one for attempting a monograph of the ostrich family, since no complete account of these singular birds has been hitherto published. Hence the origin of the first part of our work;

and thus what was originally intended to have been little more than a pamphlet has, by a "process of evolution," become a volume! It may be confidently stated that no pains have been spared to make it as complete as possible, and from the "List of Works and Articles quoted or referred to," some idea may be formed of the labour which has been entailed in its preparation.

In offering to the public the result of our united efforts, we beg to tender our acknowledgments to those who have rendered us valuable assistance.

To the Zoological Society of London we are indebted for permission to make use of several appropriate wood engravings from the "Proceedings" of the Society, which will be found at pp. 56, 86, 93, 101, 104, 108, 111, 115, and 116.

We desire to express our great obligations to Her Majesty's Legations in Morocco, Algeria, Barbary, Egypt, and Buenos Ayres, and to his Excellency the Governor of French Senegal, for the valuable reports which will be found in the Appendix.

To Commander Cameron, R.N., C.B., for an interesting note on the ostrich in Central Africa, to M. F. Goy of Paris, and M. Gros of Paris and Cairo, for their reports on the ostrich-feather trade and ostrich-farming in Egypt, and to M. Carel of Havre for much useful information on the feather trade in La Plata, our thanks are also due, and must here be recorded.

LIST OF WORKS AND ARTICLES

QUOTED OR REFERRED TO IN THE FOLLOWING PAGES.

- ADANSON, Michael, "Voyage to Senegal, the Isle of Goree, and the River Gambia." Translated from the French. 8vo. Lond. 1759.
- ANDERSSON, C. J., "Lake Ngami ; or, Explorations and Discoveries during Four Years' Wanderings in the Wilds of South-West Africa." Imp. 8vo. Lond. 1856.
- "The Okavango River." Imp. 8vo. Lond. 1861.
- "Notes on the Birds of Damaraland and the Adjacent Countries of South-West Africa." Edited by J. H. Gurney. 8vo. 1872.
- ARNOULT, E., et ROULLIER-ARNOULT, "Notice sur les Couveuses Artificielles" (avec 10 figures). Bull. Soc. Imp. Acclim. 1875. pp. 721-731.
- AYALA, Don Froylan de, "Sur les Résultats de l'Incubation des Autruches et des Dromées en 1862 au Parc Royal du Buen Retiro, près de Madrid." Bull. Soc. Imp. Acclim. 1862. pp. 670-672.
- AZARA, Don Feliz d', "Voyages dans l'Amérique Méridionale," 1781-1801. (Art. "Le Nandu, Churi, ou Autruche," vol. iv. pp. 170-175.) 4 vols. 8vo. Paris. 1809.
- BAKER, Sir Samuel, "The Nile Tributaries of Abyssinia." 8vo. Lond. 1872.
- "Ismailia: A Narrative of the Expedition to Central Africa for the Suppression of the Slave Trade, organised by Ismail, Khedive of Egypt." 2 vols. 8vo. Lond. 1874.
- BALDWIN, W. C., "African Hunting and Adventure from Natal to the Zambesi." 8vo. Lond. 1863.

- BARTLETT, A. D., "On *Apteryx mantelli*." Proc. Zool. Soc. 1850.
p. 275.
"On *Dromæus irroratus*." Proc. Zool. Soc. 1859. p. 205.
"On the Incubation of *Apteryx mantelli*." Proc. Zool. Soc.
1868. p. 329.
- BENNETT, Dr. G., "Gatherings of a Naturalist in Australia." 8vo.
Lond. 1860.
- BENNETT, W., "Acclimatisation and Breeding of Emus in Surrey."
"The Zoologist." 1863. pp. 8313-8324; and 1864. pp.
9200-9206.
- BLANFORD, "Observations on the Geology and Zoology of Abyssinia."
8vo. Lond. 1870.
- BLYTH, E., "On *Casuarium uniappendiculatus*." Journ. Asiat. Soc.
Bengal, vol. xxix. (1860) pp. 27, 112; vol. xxx. (1861) p. 185.
"The Ibis," 1860, pp. 193, 306; and Ann. Mag. Nat. Hist.,
third series, vol. vi. p. 113.
On *Apteryx oweni*. "The Ibis." 1861. p. 215.
- BOUTEILLE, M., "Sur une Reproduction d'Autruches d'Afrique ob-
servée au Jardin d'Acclimation à Grenoble." Bull. Soc. Imp.
Acclim. 1864. pp. 506-511.
"Education d'Autruches à Grenoble." Op. cit. 1867. pp.
316-318.
- BREHM, Dr. A. E., "Illustrirtes Thierleben." 8vo. Hildburghausen.
1848-49.
- BROWNE, Sir Thomas, "Works." Edited by Simon Wilkin. 4 vols.
demy 8vo. 1836.
"Letters on Ostriches." Vol. i. pp. 324-335, 456.
"Essay on the Ostrich." Vol. iv. p. 337.
- BUCKINGHAM, "Travels in Mesopotamia; with Researches on the
Ruins of Babylon and Nineveh." 4to. Lond. 1827.
"Travels in Assyria, Media, and Persia; with Researches in
Ispahan and the Ruins of Persepolis." 2 vols. 8vo. 1830.
- BULLER, W. L. "A History of the Birds of New Zealand." 4to.
Lond. 1873.
- BURCHELL, W. J., "Travels in the Interior of Southern Africa." 4to.
Lond. 1822-24.
- BURCKHARDT, J. L., "Travels in Nubia in 1813." 4to. Lond. 1819.
"Travels in Syria and the Holy Land." 4to. Lond. 1822.
"Travels in Arabia." 4to. Lond. 1829.
- BURTON, Captain R. F., "First Footsteps in East Africa." 8vo. Lond.
1856.

- BURTON, Captain, R. F., "Pilgrimage to El Medinah and Meccha." 3 vols. 8vo. Lond. 1857.
 "Lake Regions of Central Africa." 2 vols. 8vo. Lond. 1860.
 "The Highlands of Brazil." 2 vols. 8vo. Lond. 1869.
- CABANIS, Dr. J., "Journal für Ornithologie." 1863. p. 318; 1864. p. 154. See HARTMANN.
- CAPPER, Colonel, "Observations on the Passage to India through Egypt and across the Great Desert." 4to. Lond. 1784.
- CARRON, J., "On *Casuarium johnsoni*." Proc. Zool. Soc. 1867. p. 474.
- CHAGOT, M., "Sur l'Autruche d'Afrique." Bull. Soc. Imp. Acclim. Lond. 1860. pp. 329-330.
- CHAPMAN, J., "Travels in the Interior of South Africa." 2 vols. 8vo. Lond. 1868.
- CHAWORTH-MUSTERS, Commander, R.N., "At Home with the Patagonians." Crown 8vo. Lond. 1872.
- CHESNEY, Colonel, "Survey of the Euphrates and Tigris Rivers." 2 vols. royal 8vo. Lond. 1850.
- COLLINS, D., "An Account of the English Colony in New South Wales from 1788 to 1801." 2 vols. 4to. Lond. 1798-1802.
- CUNNINGHAM, R. O., "The Natural History of the Strait of Magellan." 1 vol. 8vo. Edinb. 1871.
 "On the Osteology of the Rhea." Proc. Zool. Soc. 1871. p. 105.
- CURRIE, Captain, "Journal of an Excursion to the Southward of Lake George in New South Wales." 8vo. Lond. 1825.
- DANIELL, S., "Sketches of the Native Tribes, Animals, and Scenery of Southern Africa." Royal 4to. 1820.
- DARWIN, Charles, "Naturalist's Voyage round the World." 1 vol. 8vo. Ed. 1860.
- DAWSON-ROWLEY, G., "On the Speed and Weight of the *Struthionidæ*. "The Field," 1st February 1868.
 "On the Structure of the Feathers in Struthious Birds." "Ornithological Miscellany." Vol. i. p. 24. 1875.
- DEMIDOFF, Le Prince A. de, "Sur la Réproduction de l'Autruche d'Afrique, obtenue pour la première fois en Europe" (à Florence). Bull. Soc. Imp. Acclim. 1860. pp. 1-6, 439-442.
- DESDEMAÎNES-HUGON, "Les Mines de Diamans du Cap." "Revue des Deux Mondes." 1874. Vol. iii. p. 574.
- DESMEURE, M., "Réproduction d'Autruches à Florence." Bull. Soc. Imp. Acclim. 1870. pp. 205-208.

- DIGGLES, S., "Ornithology of Australia." Folio. Brisbane. 1866-1870.
- DOBRIZHOFFER, "Account of the Abipones." Translated from the German. 1749.
- DUCHAMP, M. G., "Observations sur l'Anatomie du *Dromaius novæ-hollandiæ*." Ann. Sci. Nat. (5) xvii. pp. 1-12.
- DUMBLETON, W. D., "Domesticated Ostriches Hatching their Eggs." "The Field," 12th December 1874; and 5th February 1876.
- FALCONER and CAUTLEY, "Fauna Antiqua Sivalensis; or, The Fossil Zoology of the Siwalik Hills." 8vo letterpress, folio plates. 1846-49.
- "Palæontological Memoirs." Edited by Murchison. 2 vols. 8vo. 1868.
- FERY D'ESCLANDS, "Etude sur l'Incubation Artificielle." Bull. Soc. Imp. Acclim. 1875. p. 582.
- FINSCH and HARTLAUB, "Die Vögel Ost-Afrikas;" forming vol. iv. of Baron Von der Decken's "Reisen in Ost-Afrika." Roy. 8vo. Leipzig and Heidelberg. 1870.
- FITZINGER, "Ueber den Plötzlich Eingetretenen Tod einer Sud-Amerikanischen *Rhea* (*R. americana*), und die in derselben vorgefundenen Helminthen." "Der Zoologische Garten." 1869. pp. 131-133.
- FLOWER, Professor W. H., "On the Skeleton of the Australian Cassowary." Proc. Zool. Soc. 1871. p. 33.
- FRITSCH, Gustav, "Drei jahre in Süd Afrika." 8vo. Bremen. 1868.
- GARROD, A. H., and DARWIN, F., "Notes on an Ostrich lately Living in the Zoological Society's Collection." Proc. Zool. Soc. 1872. p. 356.
- "On the Carotid Arteries in the *Struthiones*." Proc. Zool. Soc. 1873. pp. 470, 471.
- "On the Muscles of the Thigh in the *Struthiones*." Proc. Zool. Soc. 1873. p. 644.
- GOSSE, Dr. L. A., "Des Mœurs et des Habitudes de l'Autruche." Bull. Soc. Imp. Acclimat. Paris. 1857. pp. 21-37.
- "Rapport sur les Documents Adressés d'Algerie sur l'Autruche." tom. cit. pp. 331-343, 391-394, 482-486.
- "Compte Rendu de la Notice Adressé par M. Berg sur l'Autruche du Sénégal." Op. cit. 1858. pp. 581-588.
- GOULD, John, "The Birds of Australia." Folio. Lond.
- "On *Rhea darwini*." Proc. Zool. Soc. 1837. p. 35.

- GOULD, John, "On *Apteryx oweni*." Proc. Zool. Soc. 1847. p. 94.
"On *Casuarus bennetti*." Proc. Zool. Soc. 1857. p. 268.
"Handbook to the Birds of Australia." 2 vols. 8vo. Lond. 1865.
- GRAELLS, M. "Sur une Education de Dromées en Espagne." Bull. Soc. Imp. Acclim. 1861. p. 599; and 1862. pp. 91-94.
"Réproduction d'Autruches à Madrid." Op. cit. 1867. pp. 477-479.
- GRAY, Dr. J. E., "On the Egg of the Mooruk, *Casuarus bennetti*." Proc. Zool. Soc. 1858. p. 271; pl. 144.
- GURNEY, J. H., "On *Struthio australis*." "The Ibis." 1868. p. 253.
- HARDY, M., "Sur un fait d'Incubation de l'Autruche à Alger." Bull. Soc. Imp. Acclim. 1857. p. 524.
"Note sur l'Incubation des Autruches à Alger." Op. cit. 1858. pp. 306-312.
"Rapport sur l'Education des Autruches au Jardin d'Acclimation du Gouvernement à Alger en 1861." Op. cit. 1862. pp. 8-14.
"Etat de la Domestication de l'Autruche au Jardin d'Acclimation à Alger." Op. cit. 1868. pp. 103-109.
- HARRIS, Sir W. C., "Highlands of Ethiopia, including Eighteen Months' Residence at the Court of Shoa." 3 vols. 8vo. 1844.
"Wild Sports of Southern Africa." 8vo. 1839.
- HARTLAUB and FINSCH, "Die Vögel Ost-Afrikas," forming vol. iv. of Baron Von der Decken's "Reisen in Ost-Afrika." Roy. 8vo. Leipsig and Heidelberg. 1870.
- HARTMANN, Dr. Robert, "Ornithologische Reiseskizzen aus Nord-Ost Afrika." "Journal für Ornithologie." 1863. p. 318; 1864. p. 154.
"Wilhelm, "Ueber die Fortpflanzung des Emu." "Der Zoologische Garten." 1866. p. 69.
- HAUGHTON, Dr. S., "On the Muscular Mechanism of the Leg in the Ostrich." Proc. Roy. Irish Acad. Vol. ix. p. 50. Dublin. 1865.
"On the Muscular Anatomy of the Rhea." Proc. Roy. Irish Acad. Vol. ix. p. 407. 1865.
- HEAD, Captain F. B., "Rough Notes taken during some Rapid Journeys Across the Pampas and among the Andes." Post 8vo. Lond. 1826.

- HEMPRICH and EHRENBERG, "Symbolæ Physicæ, seu Icones et Descriptiones Corporum Naturalium Novorum aut Minus Cognitorum quæ ex itineribus per Libyam, Ægyptum, Nubiam, Dongolam, Syriam, Arabiam, et Habessiniam" (pars Zoologica). Folio. Berolini. 1828.
- HÉRITTE, "Etude sur la Domestication des Autruches au Cap." Bull. Soc. Imp. Acclim. 1867. pp. 122-124.
 "Elève des Autruches au Cap de Bonne Esperance." Tom. cit. pp. 319-322.
- HEUGLIN, T. von, "Systematische Uebersicht der Vögel Nord-Ost Afrikas." 8vo. Vienna. 1856.
 "Reise nach Abessinien, den Gala Ländern, Ost Sudan, und Chartum, in den Jahren 1861 und 1862." Roy. 8vo. Jena. 1868.
 "Reise in das Gebiet des Weissen Nil." 8vo. Leipzig. 1869.
 "Ornithologie Nord-Ost Afrika." 8vo. Cassel. 1869-71.
 "List of Birds Collected on the Red Sea." "The Ibis." 1859. pp. 337-352.
- HUTTON, Captain F. W., "On Cassowaries from the Solomon Islands." "The Ibis." 1869. p. 352.
- HUXLEY, Professor T. H., "On the Classification of Birds." Proc. Zool. Soc. 1867. pp. 415-472.
 "Introduction to the Classification of Animals." 8vo. Lond. 1869.
- JEPPE, F., "Die Transvaalsche oder Süd-Afrikanische Republik." Petermann's "Geographischer Mittheilungen." Heft 24. 4to. Gotha. 1868.
- JOUAN, "Note sur le Cassoar de Nouvelle Bretagne" (*C. bennetti*). Mem. Soc. Imp. Sci. Nat. Cherbourg. 1863. pp. 322-327.
 Abstract of this Article. "Rev. Zool." 1867. p. 75.
- KREFFT, G., "On *Casuarus johnsoni*." Proc. Zool. Soc. 1867. p. 482; and "The Ibis." 1869. pp. 348, 349.
- LAYARD, A. H., "Nineveh and its Remains." 2 vols. 8vo. 1848-49.
- LAYARD, E. L., "The Birds of South Africa: A Descriptive Catalogue of all the known Species occurring South of the Twenty-eighth Parallel of South Latitude." 8vo. Cape Town and London. 1867.
- LEARED, Dr., "Morocco and the Moors." 8vo. Lond. 1875.
- LEICHARDT, Dr., "Travels in Australia from Moreton Bay to Port Essington during the Years 1844-45." 8vo. Lond. 1847.

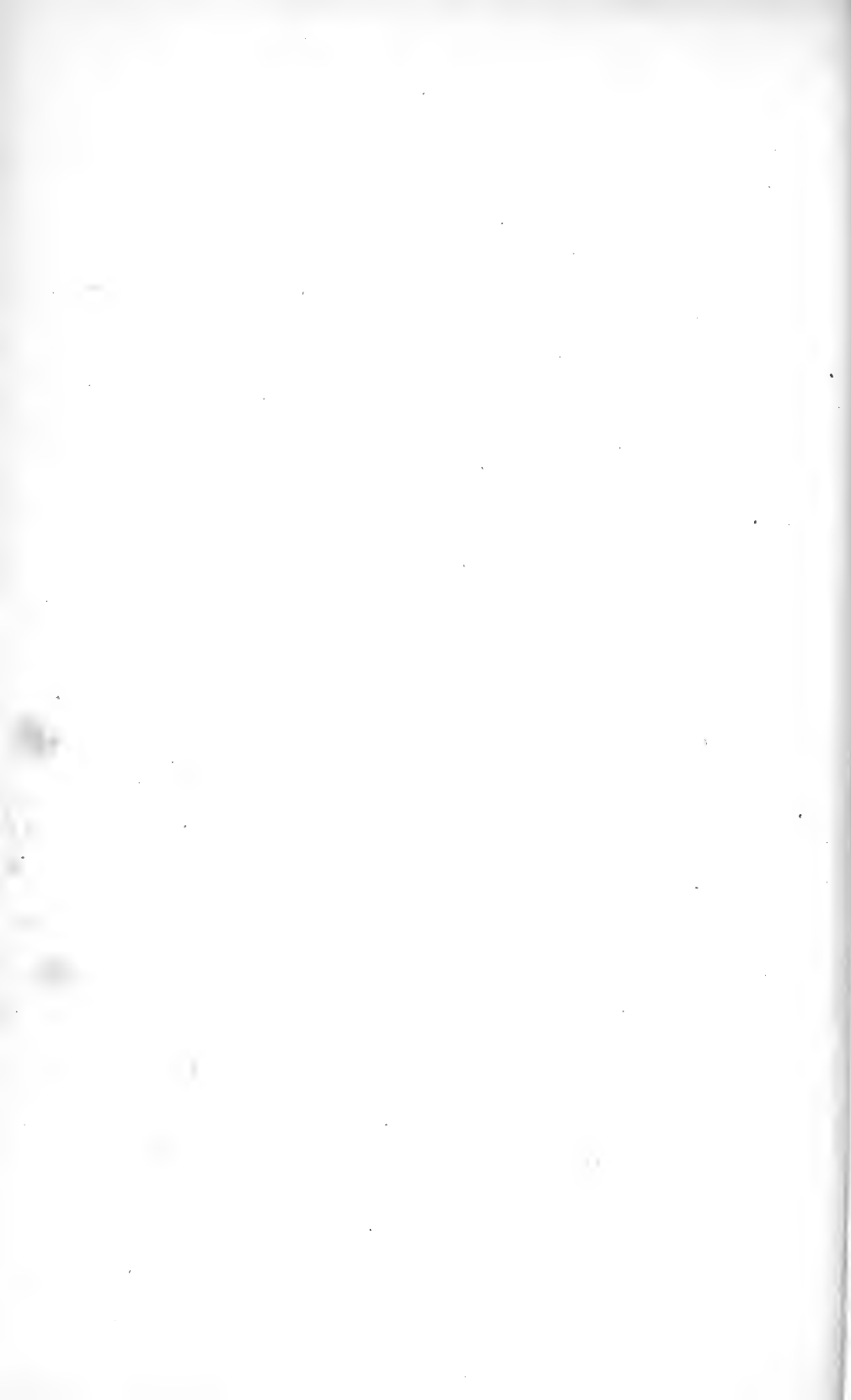
- LE PRESTRE, Dr. F. "Etude sur la Réproduction et la Domestication de l'Emeu ou Cassoar de la Nouvelle Hollande." Bull. Soc. Imp. Acclim. 1870. pp. 105-121.
- LESSON, R. P., "On *Dromiceius novae-zelandiae*." "Manuel d'Ornithologie." Vol. ii. p. 210. 1828.
- LICHTENSTEIN, H., "Reisen im Südlichen Afrika in den Jahren 1803-1806. 2 vols. 8vo. Berlin. 1811-12.
- LIVINGSTONE, David, "Missionary Travels and Researches in South Africa." 8vo. Lond. 1857.
- "Expedition to the Zambesi and its Tributaries." 8vo. Lond. 1865.
- "Last Journals in Central Africa." 2 vols. 8vo. 1874.
- LYON, Captain G. F., "Narrative of Travels in Northern Africa in the Years 1818, 1819, and 1820." 4to. Lond. 1821.
- MACALISTER, "On the Anatomy of the Ostrich." Proc. Roy. Irish Acad. Vol. ix. pp. 1-24. 1865.
- MARNO, "Ergebnisse einer Reise in Nord-Ost Afrika." "Der Zoologische Garten." 1868. p. 212.
- MARTIN DE MOUSSY, Dr., "Domestication de Nandou, ou Autruche d'Amerique." Bull. Soc. Imp. Acclim. 1860. pp. 182-186.
- MAXIMILIAN, Prinzen zu Wied, "Reise in Brasilien." 3 vols. 4to. 1823-31.
- MEYER, Dr. Adolf, "Ueber neue und ungenügend bekannte Vögel von Neu Guinea und den Inseln der Geelvinksbai." Sitz. Akad. der Wiss. February 1874.
- MEYER, A. B., "Life with the Hamran Arabs: A Journal of a Sporting Tour in the Soudan." 8vo. Lond. 1876.
- MINUTOLI, Heinrich von, "Reisen zum Tempel des Jupiter Ammon in der Libyschen Wüste, und nach Ober-Ægypten in den Jahren 1820-21." Folio. Berlin. 1824.
- MITCHELL, Major T. L., "Three Expeditions into the Interior of Eastern Australia." 2 vols. 8vo. 1839.
- MIVART, Professor St. George, "On the Axial Skeleton of the Ostrich." Transactions of the Zoological Society. Vol. viii. pp. 385-451. 1874.
- MOLINA, G. J., "Saggio sulla storia Naturale del Chili." (Art. "Il Cheuque, o sia lo Struzzo Americano," p. 220.) 4to. Bologna. 1810.
- MONTAIGNE, Michel Sr. de, "Les Essais, avec Remarques par P. Coste." 3 vols. 4to. Lond. 1724.
- MOORE, Francis, "Travels into the Inland Parts of Africa;" to which

- is added Captain Stibbs' "Voyage up the Gambia in 1723." 8vo. Lond. 1738.
- MORESBY, Captain John, R.N., "Discoveries and Surveys in New Guinea and the D'Entrecasteaux Islands. 8vo. Lond. 1876.
- MUELLER, Dr. F., "On *Casuarius johnsoni*." Proc. Zool. Soc. 1867. p. 242.
- MURIE, James, M.D., "On the Tracheal Pouch of the Emu, *Dromæus novæ hollandiæ*." Proc. Zool. Soc. 1867. p. 405.
- MURRAY, J. A., "Domesticated Ostriches Hatching their Eggs." "The Field," 12th September 1874, and 16th January 1875.
- NEWTON, Professor A., "On Professor Huxley's Classification of Birds." "The Ibis." 1868. pp. 85-96.
- "On *Casuarius johnsoni*." "The Ibis." 1868. p. 348; 1870. p. 120.
- "On *Archæopteryx*." "Encyclopædia Britannica." Ninth edition. 1875. Art. "Birds."
- NOEL SUGUET, "Note sur les Autruches élevées au Jardin Zoologiques de Marseille." Bull. Soc. Imp. Acclim. 1861. pp. 142-145, 382-391.
- OLIVIER, J., "Voyage à l'Empire Ottoman." Paris. 1790.
- OWEN, Professor R., "On the Anatomy of *Apteryx australis*." Proc. Zool. Soc. 1838. pp. 48, 71, 105; 1842. pp. 22-41. Trans. Zool. Soc. 1842. pp. 257-302; 1849. pp. 277-302.
- "On the Eggs and Young of *Apteryx*." Proc. Zool. Soc. 1852. pp. 9-13.
- "On *Archæopteryx*." Phil. Trans. 1863. p. 33.
- PALGRAVE, F., "Narrative of a Year's Journey through Central and Eastern Arabia." 8vo. Cambridge. 1865.
- PARKER, W. K., "On the Structure and Development of the Skull in the Ostrich Tribe." "Philosophical Transactions." 1866. pp. 113-183.
- "On the Anatomy of the *Ratitæ*." "Encyclopædia Britannica." Ninth edition. 1875. Art. "Birds."
- PARKYNS, Mansfield, "Life in Abyssinia." 2 vols. 8vo. 1853.
- PETHERICK, "Travels in Central Africa." 2 vols. 1869.
- POCOCK, R., "A Description of the East, and some other Countries." 2 vols. folio. Lond. 1743-45.
- POTTS, T. H., "On *Apteryx haasti*." Trans. New Zeal. Inst. 1871. p. 104; 1872. p. 195.
- "On *Apteryx australis*." "The Ibis." 1872. p. 36.

- PRICE, W., "Travels through Persia, Armenia, and Asia Minor; the Journal of Sir Gore Ouseley's Embassy to the Court of Persia." 2 vols. oblong folio. 1832.
- QUATREFAGES, A. de, "Notice sur l'Acclimatation de quelques Espèces d'Oiseaux" (*Rhea*). Bull. Imp. Soc. Acclim. 1859. pp. 61-74.
- RAMSAY, E. P., "On *Casuaris australis*." Proc. Zool. Soc. 1868. p. 388.
- REMUSAT, P., "Remarques sur l'Extension de l'Empire Chinois." Paris. 1825.
- RITTER, "Die Erdkunde Verhältniss zur Natur und zur Geschichte des Menschen, oder Allgemeine Vergleichende Geographie." (Asia.) 8vo. Berlin. 1822-59.
- RIVIERE, A., "Note sur l'Education des Autruches en Algérie." Bull. Soc. Imp. Acclim. 1868. p. 639.
- "Deuxième Etude sur l'Education des Autruches en Algérie." Op. cit. 1870. p. 566.
- ROSENBERG, G. von, "On *Casuaris kaupi*." "Journal für Ornithologie." 1861. p. 44; 1864. p. 134.
- "On *Casuaris papuanus*." "Journal für Ornithologie." 1873. p. 39.
- RUFZ DE LAVISON, Dr., "Sur le Cassoar de la Nouvelle Hollande." Bull. Soc. Imp. Acclim. 1860. pp. 576, 577.
- RUPPELL, Dr. Eduard, "Systematische Uebersicht der Vögel Nord-Ost Afrikas." Roy. 8vo. Frankfurt. 1845.
- SCHLEGEL, Professor H., "Museum d'Histoire Naturelle des Pays Bas." Livre x. "*Aves struthiones*," pp. 1-14.
- "Sur *Casuaris uniappendiculatus*." "Observations Zoologiques, in Nederl. Tidsch. v. d. Dierk." Vol. iii. p. 250. 1866.
- "Sur *Casuaris bicarunculatus*." Op. cit. p. 347.
- "Sur *Casuaris bennetti*." Op. cit. vol. iv. p. 53.
- SCHLEGEL, Dr. F., "Die Kasuare (*C. galeatus*) unserer Zoologische Garten." "Der Zoologische Garten." 1866. pp. 177-180.
- SCHMIDT, Dr. Max, "Beobachtungen über den Amerikanischen Strauss" (*Rhea americana*). "Der Zoologische Garten." 1866. pp. 8-14.
- SCLATER, P. L., "On *Rhea macrorhyncha* and the Rheas in the Zoological Society's Menagerie." Proc. Zool. Soc. 1860. p. 207.
- "Notes on *Dromæus irroratus* and *Casuaris bicarunculatus*." Tom. cit. p. 223.

- SCLATER, P. L., "On the Struthious Birds living in the Zoological Society's Menagerie." Trans. Zool. Soc. 1860. p. 353.
- "Report on the Genus *Apteryx*." Rep. Brit. Assoc. 1861. Part i. p. 176. Nat. Hist. Rev. 1861. p. 504.
- "Remarks on Struthious Birds." Rep. Brit. Assoc. 1861. Part ii. p. 158.
- "On the Method of Incubation amongst the *Struthiones*." Proc. Zool. Soc. 1863. p. 233.
- "On the Breeding of Bennett's Cassowary in the Zoological Society's Gardens." Tom. cit. p. 518.
- The same, continued. Proc. Zool. Soc. 1864. p. 271.
- "On Two Living Examples of Owen's *Apteryx*." Proc. Zool. Soc. 1868. p. 319.
- "Remarks upon a Skin of the Australian Cassowary." Tom. cit. p. 376.
- "On Kaup's Cassowary and the other known Species of the Genus." Proc. Zool. Soc. 1872. p. 147.
- "On a Cassowary received from Amsterdam" (*Westermanni*). Proc. Zool. Soc. 1874. p. 247.
- "On *Casuarus beccarii* and *C. picticollis* in the Zoological Society's Gardens." Proc. Zool. Soc. 1875. p. 84.
- "On the Young of *Casuarus picticollis*." Tom. cit. p. 349.
- "On *Casuarus beccarii*." Tom. cit. p. 527.
- "On Cassowaries." "Nature." Vol. xii. p. 516. 1875.
- SCOTT, W. J., "On the Feathers of a Cassowary from Northern Queensland." Proc. Zool. Soc. 1866. p. 557.
- SHELLEY, Captain G. E., "Handbook to the Birds of Egypt." Roy. 8vo. Lond. 1872.
- SILVER, S. W., "Handbook for South Africa, including the Cape Colony, Natal, the Diamond Fields, and the Trans-Orange Republics." Post 8vo. Lond. 1875.
- SMITH, Rev. A. C., "The Nile and its Banks: A Journal of Travels in Egypt and Nubia." 2 vols. post 8vo. Lond. 1868.
- SONNINI, G., "Voyage dans la Haute et Basse Egypte, fait par ordre de l'Ancien Gouvernement." 3 vols. 8vo. 1799.
- "Travels in Upper and Lower Egypt." Translated from the French. 4to. Lond. 1800.
- SOUTHEY, Robert, "History of Brazil." 3 vols. 4to. Lond. 1810, 1817, 1819.
- SMELT, C. S., "Emigration to the River Plate." "The Field." 24th June 1876.

- SMELT, C. S., "Deer and Ostrich Hunting in the Province of Buenos Ayres." "The Field." 22d July 1876.
- SPARRMAN, Dr. A., "Voyage to the Cape of Good Hope." 2 vols. 4to. Lond. 1786.
- STURT, Captain C., "Two Expeditions into Southern Australia." "Narrative of an Expedition into Central Australia." 2 vols. 8vo. Lond. 1849.
- SUNDEVALL, C. J., "Methodi Naturalis Avium Disponendarum Tentamen" (*Ratitæ*). 8vo. Stockholm. 1872.
- TEGETMEIER, W. B., "On the Breeding of the Emu at Clumber." "The Field." 12th September 1868.
- THOMPSON, G., "Travels and Adventures in Southern Africa." 4to. Lond. 1827.
- TOUCHARD, A., "Du Cassoar ou Dromée de la Nouvelle Hollande." Bull. Soc. Imp. Acclim. 1867. pp. 2-7.
- TREVELYAN, W., "On the Breeding of the South American Rhea in England." "Land and Water." 29th July 1876.
- TRISTRAM, Rev. H. B., "The Great Sahara: Wanderings South of the Atlas Mountains." 8vo. Lond. 1860.
- "On the Ornithology of Northern Africa." "The Ibis." 1860. p. 74.
- "The Natural History of the Bible." Post 8vo. Lond. 1873.
- VAVASSEUR, Dr., "Sur le Nandou, ou Autruche d'Amérique; et sur les moyens de l'amener à l'état de domesticité et de l'acclimater en France." Bull. Imp. Soc. Acclim. 1858. pp. 388-394.
- VIEILLOT, L. P., "Dictionnaire d'Histoire Naturelle." Vol. v. p. 345. 1816. Art. "Casoar."
- "La Galerie des Oiseaux." 2 vols. 4to. Paris. 1825-34.
- WALLACE, A. R., "The Malay Archipelago." 2 vols. crown 8vo. 1869.
- "The Geographical Distribution of Animals." 2 vols. roy. 8vo. Lond. 1876.
- WELLSTED, J. R., "Travels in Arabia." 2 vols. 8vo. Lond. 1837.
- "Travels to the City of the Caliphs." 2 vols. 8vo. Lond. 1840.
- WETZSTEIN, H., "Notes to Dr. Delitsch's Commentary on the Book of Job." Art. "Ostrich."
- WHEELWRIGHT, H., "Bush Wanderings of a Naturalist in Australia."
- YARRELL, W., "On *Apteryx australis*, Shaw." Proc. Zool. Soc. 1833. pp. 24-80.



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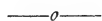
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PART I.



OSTRICHES.

BY

JAMES EDMUND HARTING.



OSTRICHES AND OSTRICH-FARMING.



INTRODUCTION.

Ostriches—Their position in a systematic classification of birds—The respects in which they differ from all other birds—The primary divisions of the order to which they belong, *Struthionidæ* and *Apterygidæ*—The five existing genera, *Struthio*, *Rhea*, *Casuarinus*, *Dromæus*, and *Apteryx*—Table of species—The natural history of the majority little known—Scope and object of the present volume.

THE Struthious or ostrich-like birds differ so materially in their structure from all other existing forms in the class AVES, that, according to the best authorities, in any system of classification they should be regarded as forming a distinct and separate order.

Professor Huxley, in his "Introduction to the Classification of Animals" (1867, p. 104), considers that the class AVES is divisible into three orders—(1) THE SAURURÆ, or lizard-tailed birds, of which only a single fossil form, *Archæopteryx*, is known; (2) the RATITÆ, or Struthious birds, characterised by the possession of a sternum or breastbone which is without a keel, and hence resembles a raft (*ratis*); and (3) the CARINATÆ, comprehending all other existing birds which have a keel (*carina*) to the sternum, more or less developed.

It is with the second of these orders, the RATITÆ,

that we have now to deal; and although it might be proper throughout these pages to confine attention solely to this order, it will possibly conduce to a better understanding of the particular respects in which the ostriches differ from all other birds, if we digress for a moment, at starting, to consider the characters which distinguish each of the three orders abovenamed.

I. The SAURURÆ, so far as at present known, are represented by a single fossil form, *Archæopteryx*, which was discovered in 1861, by Andreas Wagner, in the lithographic slate of Solenhofen in Bavaria, belonging to the Oolitic series. The unique specimen of this bird is preserved in the British Museum. It was about the size of a rook, *Corvus frugilegus*, and along with the greater portion of the skeleton, impressions of many of its feathers, particularly the quills, are plainly visible. Its most obvious peculiarity is the presence of a long lizard-like tail, composed of twenty vertebræ, from each of which springs a pair of well-developed rectrices, or tail-feathers. A scarcely less remarkable feature is that afforded by the extremity of the wings, where it would appear there was a free digit, answering to the pollex. The many reptilian characters of this singular form cannot here be noticed, though their value must be fully admitted; but since the appearance of Professor Owen's description of the specimen (Phil. Trans. 1863, p. 33) no one has hesitated to regard it as a true bird, although one which exhibits an extraordinary dissimilarity from all other known members of the class.¹

¹ Professor Newton in the *Encyclopædia Britannica*. Ninth edition. 1875. Art. "Birds," p. 728.

II. The RATITÆ, comprehending the Struthious or ostrich-like birds, differ from all others in the combination of several peculiarities. Not requiring their wings for the purpose of flight or for movement through the water, the sternum or breastbone is destitute of the normal keel, which in other birds serves for the attachment of the pectoral muscles, and ossifies only from lateral and paired centres; the long axes of the adjacent parts of the scapula and coracoid are parallel or identical; certain of the cranial bones have characters very unlike those possessed by the next order¹—the vomer, for instance, being broad posteriorly, and generally intervening between the basi-sphenoidal and the palatals and pterygoids; the barbs of the feathers are disconnected; there is no inferior larynx; and the diaphragm is better developed than in other birds.

III. The CARINATÆ comprise all other existing birds. The sternum possesses more or less of a keel, and ossifies from a median centre in that keel as well as from lateral paired centres. The long axes of the coracoid and scapula meet at an acute or (as in *Didus* and *Ocydromus*) at a slightly obtuse angle, while usually the vomer is comparatively narrow, and allows the pterygoids and palatals to articulate directly with the basi-sphenoidal rostrum.²

Although the members of the order *Ratitæ* now exist-

¹ See Mr. Parker's elaborate treatise on the structure of the skull in the Ostrich tribe, Phil. Trans. 1866, pp. 113-183, and his remarks on the anatomy of the *Ratitæ*, Encyc. Brit., Art. "Birds."

² See Professor Huxley on the Classification of Birds, Proc. Zool. Soc. 1867, pp. 415-472; and Professor Newton's epitome of this paper in "The Ibis" for 1868, pp. 85-96.

ing on the earth's surface are but few in number, there is reason to believe that at a comparatively recent geographical epoch they were in some countries numerous. "With the exception of the ostrich," says Mr. Wallace,¹ "which has spread northward into the Palæarctic region, the Struthious birds, living and extinct, are confined to the Southern Hemisphere, each continent having its peculiar forms. It is a remarkable fact that the two most nearly allied genera, *Struthio* and *Rhea*, should be found in Africa and South Temperate America respectively. Equally remarkable is the development of these large forms of wingless birds in Australia and the adjacent islands, and especially in New Zealand, where we have evidence which renders it probable that about twenty species recently co-existed. This points to the conclusion that New Zealand must not long since have formed a much more extensive land, and that the diminution of its area by subsidence has been one of the causes, and perhaps the main one, in bringing about the extinction of many of the larger species of wingless birds. The wide distribution of the Struthiones may, as already suggested,² be best explained by supposing them to represent a very ancient type of bird, developed at a time when the more specialised carnivorous mammalia had not come into existence, and preserved only in those areas which were long free from the incursions of such dangerous enemies. The discovery of Struthious remains in Europe in the Lower Eocene only supports this view; for at this time carnivora were few and of generalised type, and had probably not acquired sufficient speed and activity to

¹ Geographical Distribution of Animals, vol. ii. p. 370 (1876).

² Op. cit., vol. i. p. 287.

enable them to exterminate powerful and quick-running terrestrial birds. It is, however, at a much more remote epoch that we may expect to find the remains of the earlier forms of this group; while these Eocene birds may perhaps represent that ancestral wide-spread type which, when isolated in remoter continents and islands, became modified into the American and African ostriches, the emeus and cassowaries of Australia, the *Dinornis* and *Epyornis* of New Zealand."

Confining attention to recent species, they appear to constitute two very distinct families.

The first of these, the *Struthionidæ*, or Ostriches, embraces the largest, and, in some respects, the most mammal-like of the whole class of birds; in the other, the *Apterygidæ*, or Kiwis, the species are of small size, and present in some respects almost reptilian characters. The order *Ratitæ* thus comprises two of the most abnormal types of the whole class, which nevertheless are to a certain extent allied by unmistakable points of resemblance.

The principal characters whereby the five existing genera of the *Ratitæ* may be distinguished may be set down as follows:¹—

FAMILY I.—STRUTHIONIDÆ.

Bill short, straight, robust, and much depressed, rounded and unguiculate at the tip; nostrils longitudinal and basal; eyes large, with well-developed eyelashes; wings furnished with waving plumes; legs extremely robust; toes two or three, directed anteriorly.

I. STRUTHIONINÆ. Feathers with a single shaft; wings feathered.

1. Head and neck partially bare, or scantily covered with down; body terminated by a drooping tail; toes two, *Struthio*.

¹ This scheme is an amplification of that proposed by Mr. Selater in his memoir on Struthious birds, published in the "Transactions" of the Zoological Society for 1862.

2. Head and neck completely feathered; no tail; toes three, *Rhea*.

II. CASUARINÆ. Feathers with bifurcate shaft; wings nearly naked.

3. Head bare, with a horny elevated casque; toes three; the nail of inner toe much elongated, *Casuarius*.
 4. Head feathered; no casque; toes three; the nails short and robust, *Dromæus*.

FAMILY II.—APTERYGIDÆ.

Bill elongated, slender, and slightly decurved; the upper mandible somewhat dilated at the tip, and with a longitudinal furrow on each side throughout its length. Feathers filiform, with a single shaft; wings rudimentary and concealed beneath the general plumage; no tail; legs short, robust, and covered with hard scales; toes four, three directed forwards, one behind.

5. *Apteryx*.

The species of these five genera may be thus enumerated—

FAMILY.	SUBFAMILY.	GENUS.	SPECIES.
STRUTHIONIDÆ	STRUTHIONINÆ	Struthio	<i>S. camelus</i> .
		Rhea	{ <i>R. americana</i> . " <i>darwini</i> . " <i>megarhyncha</i> .
	CASUARINÆ	Casuarius	{ <i>C. galeatus</i> . " <i>australis</i> . " <i>beccarii</i> . " <i>bicarunculatus</i> . " <i>uniappendiculatus</i> . " <i>papuanus</i> . " <i>westermanni</i> . " <i>picticollis</i> . " <i>bennettii</i> .
		Dromæus	{ <i>D. novæ hollandiæ</i> . " <i>irroratus</i> .
APTERYGIDÆ *	{	Apteryx	{ <i>A. mantelli</i> . " <i>australis</i> . " <i>oweni</i> . " <i>haasti</i> .

On looking at this list, it will be seen that the ostrich, whose history and domestication form the special subject

of the present work, is really only one of a large number of species to which it is nearly allied, and although in a book devoted to "*Ostriches and Ostrich-Farming*" it might appear superfluous to treat of any but the African bird, there are many reasons why it has seemed to us desirable to refer at some length to the so-called ostriches of other countries.

In the first place, the natural history of these large birds is very little known to the general public. The existence of many of them has only been discovered within the last few years, and the published accounts of their appearance, haunts, and habits are both fragmentary and scattered. In the next place, it is not to the African ostrich alone that the world of fashion is indebted for feathers. A considerable number of plumes from the South American rheas find their way into the English and foreign markets; and although muffs and collarettes from the Australian and other cassowaries are not yet within reach of the fair votaries of fashion, we know that amongst the natives of Queensland, and doubtless in other parts of the antipodes, a cassowary skin is held in considerable estimation as an article of dress.

Again, there are more reasons than one why these large birds may be usefully domesticated or acclimatised. Although hitherto the object of "*ostrich-farming*" has been to furnish plumes to the feather-trade at a large profit, it may well come to pass, seeing the present prices charged for beef and mutton, that ostrich-meat may one day form an important item in our food supply.

We do not mean to assert that people will be found to prefer such diet when other food can be obtained at reasonable cost, but looking to the success which has

attended the breeding and rearing of the ostrich in South Africa, Algeria, and, on a smaller scale, in Spain, France, and Italy, the question not unnaturally arises, whether it might not be worth while to introduce these birds on English farms, with a view to rear them like turkeys for the table. Once imported, their keep is not expensive, and the meat is said to be palatable, and in flavour not unlike young beef. From a gastronomic point of view, a domesticated bird, after being fed on clover, lucerne, and grain, far excels in tenderness and flavour a wild-caught bird, which has been subsisting on such scanty and unnutritious fare as may be picked up in an African desert. But upon this point we shall have occasion later to offer some further remarks.

For the reasons above stated, and before proceeding to the special subject of ostrich-farming, we propose to present the reader with some account of the various species of ostrich-like birds with whose existence we are acquainted, pointing out their peculiarities of colour, form, and structure, the countries in which they are respectively found, with such details of their haunts and habits as we have been able to collect from authentic sources. And first it will be proper to deal with the typical species.

CHAPTER I.

THE OSTRICH.—*Struthio camelus*,¹ LINNÆUS.

The ostrich—Brief description of old and young—Its antiquity as a species—The ostrich in Scripture and in history—Assyrian and Egyptian inscriptions relating to it—Greek and Roman accounts of it—Ancient use of ostrich plumes as a head-dress—Whether more than one species of ostrich in Africa—*Struthio australis* of Gurney—Its supposed distinguishing characters—Difference in the eggs of the Northern and Southern race—The geographical distribution of the ostrich in ancient and modern times—The ostrich the “camel-bird” of the ancients—The points of resemblance to a camel—Brief anatomical details—The fleetness of the ostrich proverbial—Muscular mechanism of the leg—Length of stride and speed per hour—Its haunts and habits—Its cry—Food—Reproduction—Eggs—Native use of eggshells—Value of the feathers—Various methods of capture—Ostrich-meat—Its consumption in ancient and modern times—Ostrich feathers briefly alluded to—The consideration of ostrich-farming reserved. The ostrich capable of draught and burden.

THE existence of live ostriches in almost every zoological garden of note has doubtless rendered the species so familiar to our readers, that any detailed description of its external appearance seems unnecessary. Suffice it to say, that its chief characteristics are a small head with a short, broad, and depressed bill, a long and muscular neck, a robust body with wings incapable of flight, extremely muscular thighs and stout tarsi and feet, the latter having only two toes of unequal length directed

¹ Στρουθοκαμηλος of the Greeks; *Struzzo* and *Struzzolo* of the Italians; *Strauss* of the Germans; *Autruche* of the French.

anteriorly, the soles of which are furnished with pads or cushions especially adapted to the bird's mode of life.

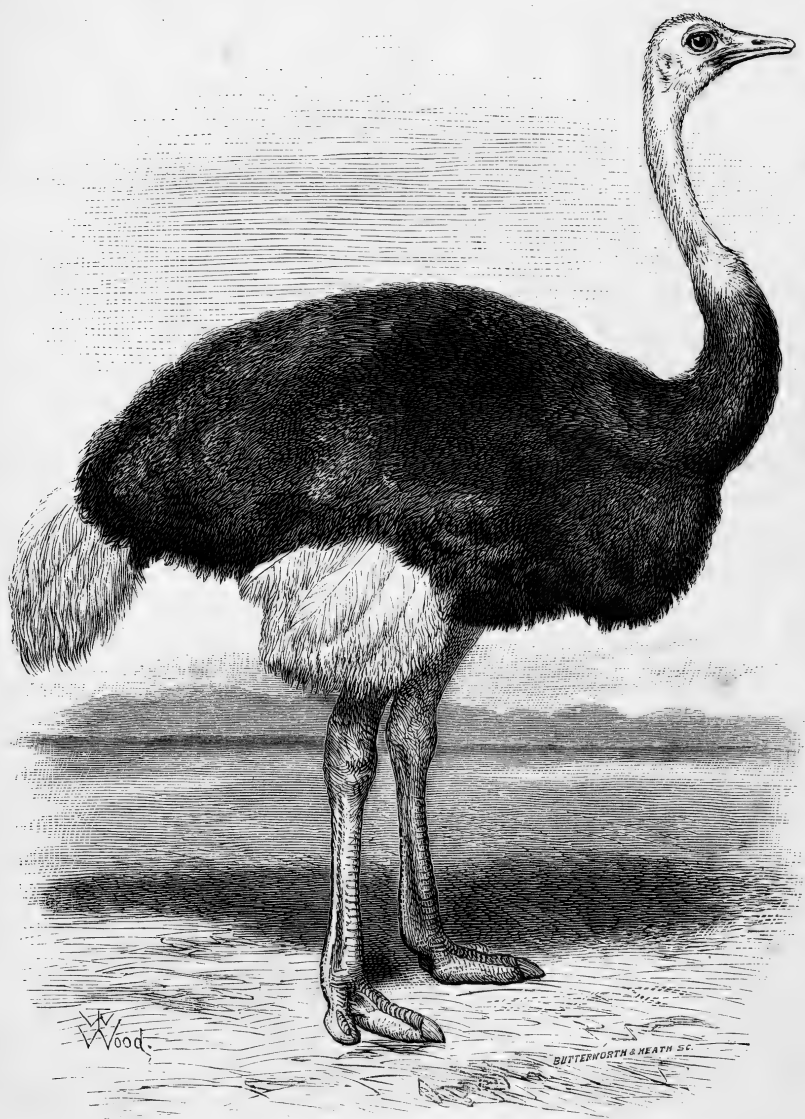
When young, the ostrich is clothed with a coarse mottled plumage of dark brown and yellowish white, which colours in the male, as the bird becomes older, change respectively to black and pure white boldly contrasted, and in the female to dusky grey. In the young the neck is bare, in the mature bird covered with short down.

The feathers which ultimately become so valuable in trade are plucked from the wings and tail, and are especially characterised by having the quill exactly in the centre of the feather, while in other birds it is a little to one side, causing the webs on each side to be of unequal width.

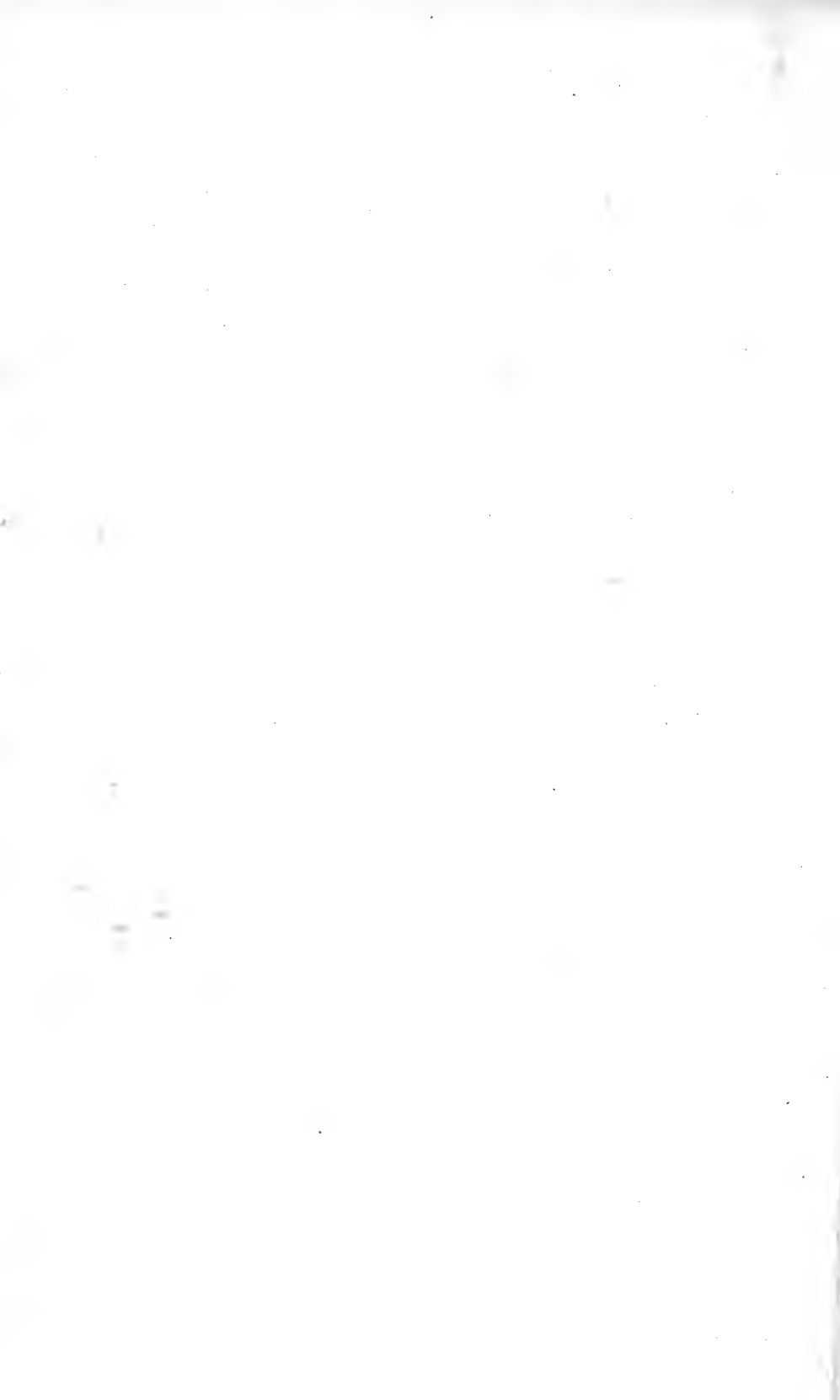
The antiquity of the ostrich as a species is evidenced by the frequent mention made of it both in Scripture and in history. But it must be observed that as regards Scripture and the passages therein contained which are supposed to relate to the ostrich, commentators are not agreed, inasmuch as the Hebrew name *ya'anah* is rendered indifferently "ostrich" and "owl." The reader, therefore, is left to determine the species rather by the context and the allusions which are made to the habits of the bird to which reference is made.

Canon Tristram, who has brought to bear on the subject the knowledge of a naturalist combined with that of a Hebrew scholar, has thus written upon the ostrich in Scripture :¹—

¹ The Natural History of the Bible, p. 233.



THE OSTRICH, *Struthio camelus*.



“The ostrich (*Struthio camelus*) is mentioned in Scripture more frequently than would appear from the reading of our version. Three Hebrew words apply to it which are otherwise translated in our text, though generally, ‘ostrich’ is supplied in the margin. The name by which it is most frequently expressed is ‘*ya’annah*’ or ‘*bath haya’annah*,’ i.e., ‘greediness,’ or ‘daughter of greediness’ (or ‘of shouting’). Our Bible reads ‘owl,’ excepting in Lam. iv. 3, where *ya’enim* is rightly rendered ‘ostriches.’ Another word, *ranân*, is applied to the ostrich in Job xxxix. 13, where our translators have rendered it ‘peacock.’ ‘Gavest thou the goodly wings unto the *renânim*?’ where the ostrich is undoubtedly intended, while the word translated ‘ostrich’ in the same verse is ‘*notseh*,’ the Hebrew for ‘feathers.’

“The first mention of the ostrich in Scripture is in the list of unclean birds in Lev. xi. 16, Deut. xiv. 16, where our version reads ‘the owl.’ It was, as might be expected from his residence in the Eastern desert, familiar to the patriarch Job, who refers to various points in its economy, some of them true, and others founded only on the popular beliefs which hold even to this day among Orientals. Thus, ‘I went mourning without the sun; I stood up and I cried in the congregation. I am a brother to dragons, and a companion to ostriches’ [owls, marg.]—Job xxx. 28, 29.

“It is the hoarse complaining cry by night to which the patriarch compares his own sorrowing lamentations under the visitation of God. The same simile occurs in Micah i. 8: ‘I will wail and howl; I will go stripped and naked; I will make a wailing like the dragons and mourning as the ostriches’ [owls, marg.]

“In the reply of the Lord to Job, the habits of the

ostrich are thus set forth, 'Gavest thou the goodly wings unto the ostriches? or wings and feathers unto the ostrich, which leaveth her eggs in the earth, and warmeth them in dust, and forgetteth that the foot may crush them, or that the wild beast may break them? She is hardened against her young ones, as though they were not hers: her labour is in vain without fear; because God hath deprived her of wisdom, neither hath He imparted to her understanding. What time she lifteth up herself on high, she scorneth the horse and his rider.'—Job xxxix. 13-18.

"Here we find mention made of the beauty of its plumes, of its habit of leaving its eggs on the surface, of hatching them in the heat of the sand, of its desertion of its young, of its reputed stupidity, and of its extraordinary fleetness. The belief that the ostrich neglected its young is used also as an illustration by Jeremiah: 'Even the sea-monsters draw out the breast; they give suck to their young ones; the daughter of my people is become cruel, like the ostriches in the wilderness.'—Lam. iv. 3.

"The other passages in which the ostrich is mentioned refer to its inhabiting the most desolate and lonely places. Of Babylon it is foretold, 'Wild beasts of the desert shall lie there; and their houses shall be full of doleful creatures; and ostriches shall dwell there, and satyrs shall dance there' (Isa. xiii. 21). Of Idumæa, 'It shall be an habitation of dragons, and a court for ostriches' (ch. xxxiv. 13). Again of Babylon, 'The wild beasts of the desert, with the wild beasts of the islands, shall dwell there, and the ostriches' (A. V. 'owls') 'shall dwell therein: and it shall be no more inhabited for ever; neither shall it be dwelt in from

generation to generation' (Jer. l. 39). In the prophecy of the universal extension of the Church in the latter days it is said, 'I will even make a way in the wilderness and rivers in the desert. The beast of the field shall honour me, the dragons and the ostriches.'—Isa. xliii. 19, 20."

To trace the earliest mention of the ostrich in history, and the various allusions to this bird which may be found in the pages of successive historians, would require more time and space than is here at our disposal. Suffice it to say, that the monuments and inscriptions of the ancient Egyptians, and the accounts of Greek and Roman authors, all point to the antiquity of the ostrich as a species, and to the general, if not intimate, acquaintance with the bird and its habits which prevailed even at the date of these early records. The elegance of the feathers, no doubt arising from their slender shafts and disunited webs, has led to their being prized in all ages.

We are informed by Professor Julius Oppert, that amongst the Assyrian inscriptions at Nineveh is one relating to a large bird named *kāzai*, which he considers to be the ostrich.

Professor Maspéro, the well-known Egyptologist, has been good enough also to communicate the fact that ostrich feathers are frequently mentioned in the Egyptian hieroglyphics under the name *shoo*. He adds, that a picture of the ostrich itself has been found in a sepulchral chamber at Thebes of the 18th dynasty, which, according to Dr. Oppert, must be contemporary with Moses. The mention of the ostrich in other Egyptian monuments is confirmed by Professor Lepsius of Berlin, and it would seem that an ostrich feather was regarded

by the Egyptians as a symbol of justice, the webs being of equal width or equally balanced on each side of the shaft.¹

Pausanias relates (x. 31) that the Egyptian queen Arsinöe, who lived some time before the celebrated Cleopatra, had her statue erected on Helicon, in which she was represented as riding on an ostrich.

Herodotus (Melpom. 175, 192) refers to a custom amongst a certain desert tribe in Lybia of making garments and shields from ostrich skins; while Strabo (Georg. vi. 4) describes a race of "Struthophages," or ostrich-eaters, who also made coverings and dresses from the skin of this bird.²

But although the ostrich is so frequently mentioned by ancient historians, there is no evidence, so far as we are aware, that its plumes were ever worn as ornaments in ancient times *by ladies*. The fact is, bonnets were unknown, the fair princesses being always veiled, and at the royal levées they were not permitted to appear. Warriors, however, wore ostrich plumes in their helmets from a very early date. In the comedy of "Acharnenses," which was represented in the theatre of Bacchus at

¹ Horapollonis Niloi—Horus Apollo Hieroglyphica. Edidit Conradus Leemanus (1825), p. 113.

Captain Burton, in his "First Footsteps in East Africa" (p. 94), says:—"Amongst the old Egyptians the ostrich feather was the symbol of truth. The Somal call it 'Bal,' the Arabs 'Rish;' it is universally used here as the sign and symbol of victory. Generally the white feather only is stuck in the hair; the Eesa are not particular in using black when they can procure no other. All the clans wear it in the back-hair, but each has its own rules; some make it a standard decoration, others discard it after the first few days. The learned have an aversion to the custom, stigmatising it as pagan and idolatrous; the vulgar look upon it as the highest mark of honour."

² See also Aristotle, De Part. Anim. iv. 12.

Athens, B.C. 425, Aristophanes depicted a general called Lamachoo, who carried two beautiful white ostrich feathers in his helmet; while both the Greek Theophrastes (*Hist. Plant.* iv. 5) and the Roman Pliny clearly indicate that ostrich feathers were thus used in their day.

In the gorgeous public spectacles in which many of the Roman emperors used to delight, the ostrich played a conspicuous part; and it seems that domesticated birds were occasionally used for riding purposes by Roman ladies of noble birth.

In our own country, during the fourteenth and fifteenth centuries, ostrich plumes were worn in black velvet caps by the nobility.

Three white ostrich feathers form the well-known badge of the Prince of Wales, and, according to tradition were assumed from the circumstance of Edward the Black Prince having plucked an ostrich plume from the helmet of John of Luxembourg, King of Bohemia, who fell by his hand at the battle of Cressi. There is no doubt, however, that ostrich feathers were long previously assumed as the badge of the Plantagenets.

The present well-known device of the three feathers within a prince's coronet were first introduced, it is said, by Prince Henry, the eldest son of James I.

But to come to the natural history portion of the subject.

Whether there is more than one species of ostrich in Africa is a question which has puzzled naturalists not a little. Mr. Sclater in the "*Transactions of the Zoological Society*" (iv. p. 354) has pointed out certain features which he considered sufficient to distinguish

the ostrich of North Africa from that of the South;¹ and as the name *Struthio camelus* was given by Linnæus to the ostrich of Syria and Arabia, with which the ostrich of North Africa is supposed to be identical, Mr. Gurney proposed (*Ibis*, 1868, p. 253) that the South African form should be designated *Struthio australis*.²

Andersson goes even further than this, and states that in his opinion there are two, if not three, species of ostrich in South Africa alone. In his "Birds of Damaraland"³ (p. 251) he says:

"Many naturalists are of opinion that the North African ostrich is distinct from that of South Africa; but, from an early date in my wanderings, I suspected that there was more than one species of ostrich indigenous to Southern Africa, though it was only in 1866 that I had the means and the necessary time to verify my surmises.

"I am now able to state that there are two distinct kinds of ostrich in Damaraland. The first species is that which is so well known throughout Southern Africa, in which the male bird is black, with white tail and wings, whilst the female is of a greyish colour. Of the second species, which is quite new to science, I have not an entire specimen by me so as to enable me to produce an accurate description of the whole bird; still I possess sufficient data to be able to vouch

¹ See also Tristram's "Natural History of the Bible," p. 239, and "The Great Sahara," p. 118.

² In this proposed specific separation of the Northern and Southern forms, Drs. Hartlaub and Finsch say ("Vögel Ost Afrikas") they cannot concur.

³ Notes on the Birds of Damaraland and the adjacent Countries of South-West Africa. By the late C. J. Andersson. Edited by J. H. Gurney. 1872.

for the correctness of my statement; for, as I write, three skins (or rather portions of skins) are lying before me, consisting of two adults, male and female, and a young bird apparently about half-grown. The male bird does not appear to differ from the well-known South African species, except in size, being larger; but the greatest specific difference lies with the female and the young, and more especially with the former, which is jet-black like the cock bird. The young is of a sooty brown, the feathers, which are narrow and come to an acute point, being tipped with light brown; the tail similar, but interspersed with a few grey or greyish white feathers; the wings like the tail, but of a softer texture; the thighs and neck white. The egg of this species is said to be larger than that of the ordinary one. This bird seems to be pretty commonly distributed over the boundless wastes and plains of both Great Namaqua and Damaraland, and herds with the common species as well as in separate flocks.

“Many of the native hunters also speak of a third species of ostrich, which they characterise by some very marked distinctions: thus, for instance, I am assured that it has a narrow but conspicuous bar across the back or rump, and a double row of quills on each wing, also that the colour is brownish grey in both sexes; nevertheless, I mention it here, more for the purpose of drawing the attention of naturalists to the subject than from any personal belief in its existence as a third distinct South African species.”

Referring to this passage, Mr. J. H. Gurney says:¹—

“I am not able to offer any opinion as to how far Mr.

¹ The Birds of Damaraland, l. c.

Andersson was correct in believing that more than one race of ostrich exists in Southern Africa; but that the ordinary South African ostrich, for which I proposed the specific name *australis* in the 'Ibis' for 1868, p. 253, differs from the true *Struthio camelus* of North Africa, I cannot doubt.

"Mr. A. D. Bartlett, the experienced and observant superintendent of the gardens of the Zoological Society of London, informs me that the skin which is visible on the thighs and other bare parts of the Northern ostrich is always flesh-coloured, whilst in the Southern ostrich it is invariably bluish, excepting the angle of the gape, which is flesh-coloured, as are also the cere and the scutellations of the tarsi and feet.

"Mr. Bartlett is also of opinion that the average height of the Southern is somewhat greater than that of the Northern ostrich, and that in the male of the Southern race the black portions of the plumage are deeper in colour than in the male of the Northern bird."

Canon Tristram, writing on the ornithology of Northern Africa,¹ says that a considerable difference is apparent in the eggs of the Northern and Southern ostrich, and he thus describes it:—

"The egg of the North African ostrich seems to differ decidedly from that of the Cape bird. I have seen hundreds of specimens, and always found them rather larger² than the Southern eggs which we generally see in England, and quite smooth, with an ivory, polished

¹ "The Ibis," 1860, p. 74.

² An egg received by Mr. de Mosenthal from Algeria in February 1876 is rather *smaller* than one received at the same time from the Cape; but the former is perfectly smooth and polished, while the latter has the surface of the shell roughly punctured all over.

surface, and free from any punctures. Until I found the eggs myself, I was under the impression that they might be polished by the Arabs; but this is a mistake."

Mr. P. L. Sclater, in the memoir before referred to,¹ speaks of the eggs of the Southern ostrich as being smoother than those of the Northern bird; but this is doubtless a *lapsus memoriæ*, as the series of eggs on which the observation was made, and which are still in the possession of Mr. Bartlett, show that the contrary is the fact, and that Canon Tristram's statement is correct.²

The more recent investigations in zoology, however, of Dr. Blasius, jun., have materially shaken the belief in the importance of these characters as regards the difference of species.³ Indeed, notwithstanding the opinions of the competent naturalists just quoted, it seems highly probable that the differences of size and colour to which they refer are such as may be reasonably accounted for on the score of age, sex, and that individual variation which, induced doubtless by difference of food and climate, has been observed in many other species of birds and mammals. Believing this to be the case, we have no hesitation in expressing the opinion that there is, after all, but one species of ostrich in Africa.

The geographical range of the ostrich, so far as can be ascertained from the published accounts of travellers and naturalists, is very extensive, although at the present day, no doubt, it is much more restricted than was

¹ Transactions of the Zoological Society, vol. iv. p. 354.

² See also Gurney, in Andersson's "Birds of Damaraland," p. 256.

³ Finsch and Hartlaub, "Vögel Ost Afrikas," p. 607.

formerly the case. At one time its distribution northward seems to have extended from Senegambia on the west, through Southern Morocco, Algeria, and Egypt, into Arabia, Syria,¹ and even Mesopotamia on the east; for according to Xenophon (*Anabasis*, I. v. 2) it was formerly to be met with in the plains of Artemisia near Thapsacus, on the left bank of the Euphrates; and it is possible that within historic times it penetrated even farther to the eastward as far as Sindh, since modern palæontologists affirm that fossil remains of the ostrich have undoubtedly been met with at the base of the Sivalik Hills in North-West India, together with the remains of the camel and giraffe.² The whole subject of the distribution of the ostrich in Africa and Asia has been so fully and ably worked out by Drs. Finsch and Hartlaub in their excellent work "*Die Vögel Ost Afrikas*,"³ that we cannot do better than give the substance of their remarks in the following translation, adding by way of footnotes and fresh paragraphs such additional information as has come to hand since their remarks were published:—

From Southern Algeria to the interior of the Cape Colony the ostrich is found throughout Africa wherever an open country with Karoo or desert land suits its nature, and where increasing cultivation and persistent

¹ Canon Tristram states, in his "*Natural History of the Bible*," p. 239, that it approaches Palestine on the south-east, and he possesses a skin which was obtained on the Belka, close behind the hills of Moab. He adds, however, that it is much more rare there than formerly. In the Great Sahara, he states, one of the nomad tribes, "the Weled Saâd Ben Salem, partially occupy themselves with the chase of the ostrich, of whose range this is the northernmost limit."—*The Great Sahara*, p. 83.

² Falconer and Cautley, *Fauna Antiqua Sivalensis*.

³ This work forms the fourth volume of Baron von der Decken's "*Reisen in Ost Afrika*," published at Leipsic and Heidelberg in 1870.

hunting has not driven it away. That this is the case in many localities there is no doubt. Hartmann states that where in 1823 Hemprich and Ehrenberg hunted ostriches, namely, in the interior of the Bahiuda country, the species is now extinct, as it is on all the routes to Kartoom through the Bahiuda desert from Old Dongola, Buri, Dubbeh, and Ambukol: it is now hardly ever met with north of 17° N. lat.¹ The same may be said of the plains of El Mograh between Cairo and Suez, where in 1816 Burckhardt saw many wild ostriches. Von Heuglin looked in vain for them in the Lybian desert and in Central Egypt; but Prince Halim Pasha, a trustworthy hunter, assured him that within a few days' journey from Cairo he found freshly-disturbed ostrich nests and breeding-places.

In these countries formerly, frequent mention was made of the bird. Pocock states² that in 1743 he met with it in the hilly desert lands to the south-west of Alexandria. Sonnini saw fresh tracks in the desert of Bahireh,³ and Minutoli noticed flocks of from ten to fifteen birds on the route from Alexandria to Siwah and Dernah, where they were hunted with the ancient device of the screen (or stalking-horse), behind which the hunters concealed themselves.⁴

Hartmann was informed by the mounted Bedouins in the service of the Pasha, called Mogreb, that the ostrich was by no means rare in the bush-covered

¹ Dr. Leared, in his recent work "Morocco and the Moors," states (p. 308) that the ostrich is only met with in the south of that country, about Wadnoon and the borders of the Sahara. Birds of the largest size and finest plumage are found in this district.

² Pocock, *Descr. East*, vol. i. p. 209.

³ Sonnini, *Travels in Egypt*, vol. i. p. 396.

⁴ Minutoli, *Reise*, p. 205.

valleys of the Lybian desert, and that it is of still more frequent occurrence in the deserts of Kordofan on the White Nile, especially to the south of the Nuwerlande on the Blue Nile (where, avoiding the high forest growth along the river bank, it keeps to the interior of the Khalah desert), as well as in the districts of the Beschari and Shukurieh, towards Gebel-Manderah and Nakub-Kheli-Rerah.¹ In rainy years it has been known to appear in the desert of Southern Nubia. In Gedarich it has been met with in open grassy desert land covered with acacias and other shrubs. From a verbal statement of Beurmann, it appears that ostriches were observed in the year 1860 between Berber and Suakin, and more recently in Baraka. Barth during his long travels found this bird nowhere more numerous and less shy than in the open bushy plains of Airs—for instance, in the plain of Tin-teggana, where it abounds. In the most southerly parts of the Sahara, Gerard Rohlfs observed ostriches on the road between Tripoli and Kuka in the undulating verdure-clad plains of Tintumma near Belkaschifari, and consequently beyond the southern limits of the desert, and here they were found in large numbers. The Darfurer Gellabin tribe informed Hartmann that they obtain their ostrich feathers (an important article of trade with them) from the Bedouin tribes Hamr, M'Aalia, Ergat, Mahamid, Mahrieh, and Saidieh, and bring them to Sioot in Upper Egypt. On the Red Sea, according to Heuglin, the most northerly locality for the ostriches is the plains about Berenice Troglodytica (24° N. lat.). It is common, he says, in the plains of Habab, and although not

¹ Hartmann, *Journal für Ornithologie*, 1863, p. 318; 1864, p. 154.

met with in the Danakil country, it certainly occurs in the saline plains that separate the latter from Abyssinia. It is common, too, he adds, in the Somali country.¹ In Abyssinia it was only met with in the lowlands, especially in the Mareb.² Carlo Piaggia, who has paid some attention to the birds of the Niam-Niam country, does not mention this species. Captain Burton saw ostriches in the maritime valleys south of Saila, but they were very wild and shy, and kept out of rifle range. He was assured by the Rev. Mr. Erhardt of the Mombas Mission that this was likewise the case farther south.³ Von der Decken's expedition remarked the same thing. Rarely, they said, did an ostrich egg refresh them, and amongst the frontier tribe Masai they seldom saw any ostrich feathers worn as head ornaments. But they met with the bird not far from Kilibassi, on a high tableland covered with luxuriant grasses and thick forest growth in the interior of Marseh, throughout a district enlivened by antelopes and ostriches. Captains Burton and Speke encountered ostriches first on the journey to the Tanganyika on the plateau of Ugogo, from whence it wanders through Unyamesi and Usukuma to Ujiji.⁴

"The polygamous bird," says Capt. Burton, "was first observed on the Ugogo plateau; it extends through Unyamesi and Usukuma to Ujiji. The eggs

¹ See "The Ibis," 1859, p. 343.

² Mansfield Parkyns, writing in 1853, in his "Life in Abyssinia" (vol. ii. p. 303), says the ostrich is found to the north of Abyssinia, and in the wilder districts of that country. Sir Samuel Baker saw very few ostriches in Abyssinia, and only once succeeded in getting a shot at one of a pair, as they fled from the river-side where they had been drinking (Nile Tributaries of Abyssinia, p. 273).

³ Burton, *First Footsteps in East Africa*, p. 163, note (1856).

⁴ Burton, *Lake Regions of Central Africa*, vol. i. p. 301 (1860).

are sold, sometimes fresh, but more generally stale: Emptied and dried, they form the principal circulating medium between the Arab merchants and the coffee-growing races near the Nyanza Lake, who cut them up and grind them into ornamental discs and crescents. The young birds are caught, but are rarely tamed. In Usukuma the bright and glossy feathers of the old male are much esteemed for adorning the hair; yet, curious to say, the bird is seldom hunted. Moreover, these East Africans have never attempted to export the feathers, which, when white and uninjured, are sold even by the Somal for eight dollars per pound. The birds are at once wild and stupid, timid and headstrong: their lengthened strides and backward glances announce terror at the sight of man, and it is impossible to stalk them in the open grounds which they prefer.”¹

Lieutenant Cameron, R.N., writing to Mr. de Mosen-thal in May 1876, in reply to his inquiries concerning the ostrich in Central Africa, says:—

“I saw ostriches at Unyanyembe (5° S. lat. 33° E. long.) on my journey across; these had been brought from the countries N.E. of that place. During my naval service on the East Coast, from 1866 to 1870, I saw ostriches at Zanzibar, brought from the interior. They are said to be abundant in the Masai Country, N.W. of Mombasa, behind the Gallas, extending to the Victoria Nyanza. Ostrich eggs are brought to Benguela from the S.E. I do not believe that latitude has anything to do with the habitat of the ostrich. It depends upon the nature of the country. Why ostriches are only found on great

¹ Lake Regions of Central Africa, vol. i. p. 301.

plains is, I believe, because they are utterly unfitted for woody and hilly districts. From their great speed, they can live, like antelopes and zebras, in a country with very little water. The reason for their not being found in the districts you mention is, that they are wooded and hilly."

Zanzibar and Mozambique, with the wooded and marshy plains of the Zambesi country, seem quite destitute of ostriches, and, according to Professor Barboza du Bocage, the same may be said of the Portuguese colonies on the west coast of Africa, Congo, Angola, and Benguela. Even in countries still farther south the bird is unknown. Mohr, who travelled through Zululand, a hilly and grassy country, looked in vain for ostriches, although, according to Jeppe,¹ the bird is found in flocks of from ten to thirty individuals in the neighbouring Transvaal Republic.²

In regard to the existence of the ostrich in Asia, it seems desirable to give some details here, for in Brehm's well-known work, "*Illustriertes Thierleben*," which contains one of the best compilations on this

¹ Petermann, Geogr. Mittheil. Erg., Heft 24, p. 6.

² Baldwin in 1857 saw ostriches in the Transvaal and in the Bechuana country, but found them shy and wary. Near Kapong, in the latter country, he got a long shot at one, but "he was going like the wind." Some time afterwards, near Nanta, he had another shot, which proved, however, to be equally unsuccessful. The Maccalacas Kaffirs, he states, use ostriches eggs for water-vessels, scooping up the water with a tortoise-shell, and carrying the eggs, a dozen or more at a time, in a skin or kind of network slung to their backs. "I was much amused," he adds, "on one occasion, at my Kaffirs trading with the Maccateese (Bechuanas) for ostrich feathers; they could not understand one word of each other's language, and my fellows were trying to make them believe buttons were money, and would buy of the white man cow, horse, or gun. They eventually succeeded in buying a lot of black feathers for ten buttons."—Baldwin's *African Hunting*, second edition, pp. 143, 178, 181, 420 (1863).

gigantic bird, not a syllable is said upon the subject.

Nevertheless, the ostrich formerly inhabited Central Asia and India, while in Syria, Arabia, and Mesopotamia it has been known from time immemorial. Yet, strange to say, Herodotus, Strabo, Aristotle, and Pliny all mention the ostrich only as an African bird. Diodorus, however, clearly refers to it amongst the animals of that part of Arabia which adjoins Syria. The passage is quoted by Bochart. Mr. A. H. Layard, in his account of Nineveh, informs us that ostrich feathers appear as ornaments on the robes of the figures in the oldest sculptures of Nimrod, together with the emblematic flower, and frequently figures on the Babylonian and Assyrian cylinders, from which we may conclude that the ostrich was a sacred bird. That it was known in ancient times to the Jews is clear from its being so often mentioned in the Old Testament.

* * * * *

Xenophon observed the ostrich in the plains of Artemisia on the left bank of the Euphrates, in the neighbourhood of Thapsacus (*Anabasis*, I. v. 2). Amongst English authors, Canon Tristram, referring to the alleged former existence of the ostrich in Sindh, states that a friend of his, Mr. Surtees, who resided there for some time, heard many traditions to this effect.¹

It is worthy of note, that in the history of the celebrated march of Alexander the Great through Asia, no mention is made of the ostrich in India. Contrary to expectation, also, Sanskrit literature is silent on this

¹ But the native name, which he might have supposed applied to this bird, might, after all, have been applicable to some species of bustard.

subject, for neither Lassen nor Kosmas make any allusion to this bird.

* * * * *

Herr Schlagintweit, in reply to Dr. Hartlaub's inquiries, stated that during his travels in India he never obtained any proof of the existence of the ostrich there at any time, although in the valley of the Ganges ostrich eggs were sometimes offered as articles of commerce to the pilgrims proceeding to Mecca. But these eggs were doubtless of Arabian and not Indian origin. The late Mr. Blyth, during a long residence in India, was unable to procure any evidence of the former existence of the ostrich either in Sindh or Beluchistân. He says, however, that ostrich eggs imported from Africa or Arabia are frequently met with in India, and are hung up in the mosques. Those which one sees in all the Turkish mosques hanging from the ceiling, are, without exception, presents from Mecca pilgrims. The same custom, says Buckingham, prevails at the Great Mosque of Orfa in Central Mesopotamia.¹ The ostrich is mentioned by Marco Polo only in his "*Inde Moyenne*," by which, as is well known, he means Abyssinia.

The vague statement of Cælian (xiv. 13), to the effect that the King of India supped on the eggs of ostriches, swans, and geese, may be referred to as the only historical notice of the ostrich in India, and therefore not unimportant.

* * * * *

Ritter has some remarkable notes which demonstrate the probability, if not the certainty, that at one time the ostrich must have lived in Central Asia.² In the

¹ Travels in Mesopotamia, 1827, p. 132. ² Ritter, Asia, vol. vii. 636, 638.

Chinese work *Sse-ma-Tsien*, edited by Brosset, we read (vol. ii. p. 433), that in the year 107 B.C. the Chinese sent an embassy to Ansi (Bokhara), and on its return several of the people of Ansi, who joined the embassy, brought eggs from their large birds (ostriches) as presents, which were much admired by the Chinese, who compared them to their china vases. Much later, namely, in the year 650 A.D., it appears from Remusat's edition of the Chinese author Matuanlin, that the King of Samarkand (Khangkin) paid a tribute to China in ostrich eggs. About the same time, also, says Remusat,¹ the ambassadors of Youechi (Yueti), the modern Thokaristan or Turkestan, brought a live camel-bird or ostrich as a present to China.² Again, referring to the plateau of Iran, Ritter's notice seems important. He says, according to Cedrenus, about the year 627 A.D., at one of the courts of the Sassanides Pallastes Beklal, between the river Digahlah and the little Zab river (ruins of Dastagerd), ostriches used to be kept in confinement.³ Professor Hermann Vambéry informed Drs. Finsch and Hartlaub that although he had not himself seen the ostrich during his travels in Asia, it was not unknown, even at the present day, in Southern Persia about Kerman. In Central Asia he had only heard of the bird on the Lower Oxus, especially in the neighbourhood of Kungrat, where it appears as a straggler from the southern deserts.

Turkoman hunters know the ostrich as the *Töje kushu* or camel-bird. In Central Asia it is sometimes called

¹ Remarq. sur l'extens. de l'Emp. Chin., 1825.

² See also Ritter, op. cit., vol. vii. p. 571.

³ Ritter, op. cit., vol. ix. p. 504; Hist. Compend., vol. i. pp. 731-734, Bekker's ed., 1838.

Sanduk kushu or coffer-bird, possibly from the form of the body—like a coffer resting on a high pedestal.

* * * * *

Colonel Capper,¹ while on the road from Aleppo to Bussorah, saw troops of antelopes and ostriches, but at a great distance. Olivier,² describing his tour through the Arabian Euphrates desert to Taigibeh, says that he observed ostriches in greater numbers than usual, but a long way off. Towards Bagdad, where the extensive plains were formerly covered with saline plants, mimosas, and fragrant absinthia, he remarked that the wild ass and the ostrich were no longer found, as in Xenophon's time; their appearance on the Nisibis road, too, being quite a rare occurrence.

In the Euphrates desert, says Wellsted,³ from Hit to Damascus, ostriches might be seen in flocks, but were not easily approached; and Petermann also states⁴ that ostriches occur in this desert, whence the Arabs bring eggs, feathers, and even whole skins, to Sug and Schiuch on the Lower Euphrates, not far from Bussorah. Ainsworth, in his work on Assyria, merely observes that the ostrich continues to get rarer in Western Asia.

Mr. A. H. Layard, picturing a spring in Mesopotamia, describes horsemen near the village of Nimrud with bunches of ostrich feathers tied on their long spears. Captain Burton, too, similarly describes the lances of the Hejaz Bedouins in Arabia.⁵

In regard to Syria, Burckhardt speaks of ostriches in

¹ Capper, Obs. Pass. Ind., 1784, p. 88.

² Olivier, Voy. l'Emp. Ottom., 1790.

³ Wellsted, City of the Caliphs, 1840.

⁴ Petermann, Reis. Orient, vol. ii. p. 125.

⁵ Burton, Pilgrim. El Medinah and Meccha, vol. ii. p. 105.

the great Syrian desert, especially in the plains extending from Hauran to Gebel-Shammar and Neyd.¹ Solitary birds were met with in Hauran, and every year some are killed within a short journey of Damascus. According to Canon Tristram, the ostrich, even at the present day, is occasionally to be found wandering from Arabia towards the Belka, to the south-east of Palestine. He himself obtained a specimen there, shot by the Sheik Aghyle Agha.

The Prussian Consul at Damascus, Herr Wetzstein, well known for his Oriental researches, informed Drs. Finsch and Hartlaub, through their friend Dr. Bastian, of Berlin, that the ostrich is chiefly confined to two districts, namely, the Bassida, between the Belka and the Schemmar Mountains, and the Dekhena, a stony desert in the direction of these same mountains. Skins of the bird are brought to Damascus by the Montefiek, a nomad tribe of the Ruwala, generally in the month of May. Herr Wetzstein sometimes saw as many as fifty ostrich skins in their tents, and the number annually exported to Marseilles may amount perhaps to five hundred. In consequence of this general exportation, there are none left in the bazaars at Damascus.

Amongst the notes with which Herr Wetzstein supplied Dr. Delitsch for his "Commentary on the Book of Job," the following occurs at p. 476 :—"Ostriches are frequently found in the vast sandy plains of Ard-ed-Dehana, between the Schemmar Mountains and the Sawâd. From thence the hunters return to Syria at the end of April with their spoils, consisting of ostrich skins with all the feathers on. Such a skin is called *Gizze*."

¹ Travels in Syria, 1822. See also Chesney, Jour. Euphr. Exped., vol. i. p. 588; and Layard, "Nineveh and its Remains," vol. i. p. 324.

The doubt expressed by Dr. von Heuglin as to the existence of the ostrich at the present day in Arabia is evidently unfounded. Capt. Burton states positively that the bird is not rare in El Hejaz, that the young are caught and tamed, and that the eggs are sold in the bazaars of Medina.¹ Still more important is the evidence of Palgrave, who saw ostriches in North-West Arabia, on the way from Mâan to Djouf. "Here," he says,² "we sighted a large troop of ostriches; no bird on earth is more timid, or more difficult of approach. When we saw them far ahead, running in a long line one after the other, we almost took them for a string of scared camels. The Sherarah hunt them, as their plumage is largely bought up on the frontier, to be re-sold in Egypt or Syria. But their greatest enemies are the Solibah-Bedouins." These are most likely the hunting tribe of the Sulabah, mentioned by Herr Wetzstein.

So much, then, for the distribution of the ostrich in Asia in ancient and modern times. It is as certain that it still exists there as that it is becoming rarer and rarer every year. It only remains to add, that in the rich fossil strata of the Sivalik Hills of North-Western India, fossil remains of this bird have been found, intermingled with those of the camel, giraffe, and other animals.

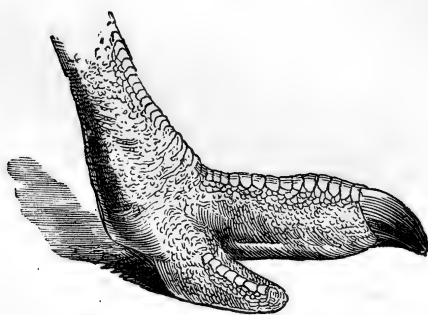
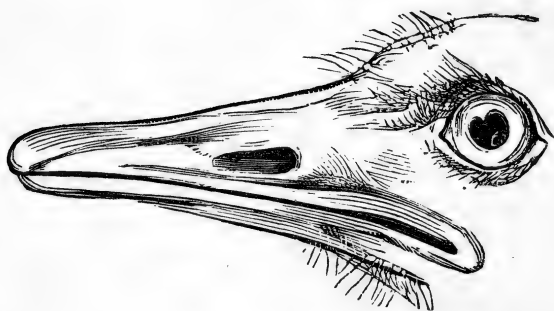
Attention has already been directed (p. 3) to the characters which distinguish the ostrich from all other birds, but a few additional details of interest may here be noted.

The ancients called this species the "camel-bird," a name which to this day has an equivalent amongst the

¹ Burton, *Pilgrim, El Medinah and Meccha*, vol. ii. p. 105.

² Palgrave, *Trav. Arabia*, i. p. 43.

Arabs and native tribes of many parts of Africa. The resemblance, indeed, which it bears in many peculiarities of structure to the ruminating animals, no doubt led Aristotle to assert that it was partly bird and partly quadruped, a notion which was also shared by Pliny. The long neck and small-set head; the large eyes, with their long lashes and overhanging brow; the muscular



Head and Foot of Ostrich.

thighs, denuded of feathers; the cloven feet, with their padded soles, well adapted for crossing large tracts of yielding sand, are obviously points in which it strangely resembles the camel. Other analogous peculiarities, although not externally apparent, are equally noteworthy. In the camel there is a large callous pad on

the chest, upon which, when reposing, the animal throws a great portion of its weight. In the ostrich, the sternum or breastbone, which, as already stated, has no keel, is merely a convex bony shield, but is covered with a callous pad or cushion, having a hard, rough surface, denuded of feathers, on which the bird leans when at rest.¹ The large sac-like form of the proventriculus, with its system of glands for secreting a solvent fluid wherewith to reduce its food, is noteworthy. Nor ought we to overlook the developed condition of the diaphragm, which muscular expansion in the apteryx is complete. Like the camel, this remarkable bird is admirably adapted in its structure for traversing the desert and dwelling beneath a burning sun.

"When seen at a distance moving over the desert," says a modern traveller in Egypt,² "the camels struck me as resembling in a most remarkable degree their desert companion the ostrich. It may seem strange to say that a bird and a quadruped have the same profile, yet such is undoubtedly the fact with these two denizens of the same sandy wilds: both hold their heads very forward, with necks much elevated and stretched out; then the long legs of the camel are all near together, whereas those of the ostrich are wide apart, and the result is that, seen at a distance, these two very different creatures might be easily mistaken for each other. Nor is this a fancy peculiar to myself alone, for since writing the above impression, as it struck me in Egypt, I have read in Palgrave's admirable book on 'Central and

¹ This was long ago remarked by Sir Thomas Browne in a letter to his son dated February 4, 1681. See Wilkin's edition of his "Works," vol. i. p. 456, and vol. iv. p. 337.

² Rev. A. C. Smith, "Attractions of the Nile," vol. i. p. 108 (1868).

Eastern Arabia,' that the sight of ostriches running in a line struck that experienced traveller as having a strange resemblance to a string of camels on the march."¹

The fleetness of the ostrich is proverbial; and although it would be out of place here to enter upon anything like a detailed account of the bird's anatomy, a brief allusion may be made to the muscular mechanism of the leg of the ostrich, which may be regarded as one of the most interesting pieces of mechanism to be met with in the animal kingdom.²

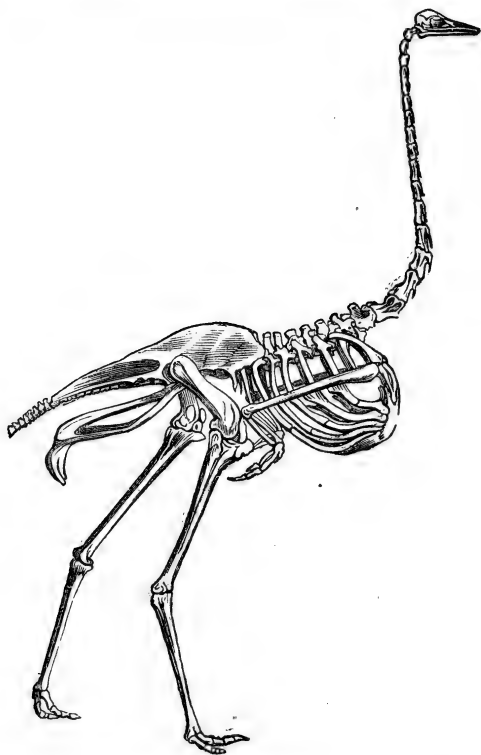
Dr. Haughton in an elaborate paper on the subject³ says:—"The leg of the ostrich is to be regarded as a long rod bent at four distinct points, which attains its greatest amount of shortening or bending at the moment the foot touches the ground, and which is suddenly straightened or elongated by the simultaneous contraction of all the muscles. The effect of the sudden elongation of the leg is to throw the whole body of the bird forward, as if from a catapult, from the point of support of the foot; and while the body of the animal is thus projected through the air, the antagonist muscles that flex the several joints come into play, and are assisted in their action by some very remarkable contrivances in the heel-joint." These Dr. Haughton describes and figures.

¹ Palgrave's remark is, "When we saw them far ahead, running in a long line one after the other, we almost took them for a string of scared camels."—*Op. cit.*, vol. i. p. 43.

² For details of anatomy, the reader may be referred to the following sources of information, viz., MacAlister, *Proc. Roy. Irish Acad.*, ix. pp. 1-24 (1865); Haughton, *ib.* p. 50; Parker, *Phil. Trans.*, 1866, pp. 113-183; Huxley, *Proc. Zool. Soc.*, 1867, p. 419; Garrod and F. Darwin, *Proc. Zool. Soc.*, 1872, p. 356; Mivart, *Trans. Zool. Soc.*, 1874, pp. 385-451; Parker, *Encycl. Britann.*, new ed., art. "Birds," pp. 722, 723, &c. (1876).

³ *Proc. Roy. Irish Acad.*, vol. ix. p. 50.

"It is necessary," he says, "to the perfection of the mechanism, that the greatest possible amount of muscular force shall be expended in straightening or unbending the legs alternately projecting the animal from foot to foot along the ground, the leg being at its maximum of flexure at the moment of touching the



Skeleton of Ostrich.

ground, and at its maximum of elongation at the moment of leaving it; and also, that the minimum possible amount of force shall be expended in flexing each leg preparatory to its next spring, which must take place on touching the ground."

Dr. Houghton shows that the leg of the ostrich fulfils

these two conditions of perfect mechanism, and describes in detail the muscles employed in the act of running.

Describing the action of the muscles, he says (tom. cit. p. 57): "In the act of running, the leg of the ostrich is to be regarded as a jointed lever having four joints, viz., the hip, the knee, the heel, and the metatarsal joints. As the animal springs from foot to foot, the whole limb on reaching the ground is bent as far as possible at each of the articulations, and when the spring is made, the muscles proper to each joint increase the angle made by the bones meeting at the joint, so that the effect of the whole is to unbend the limb, and give it a maximum of extension at the moment of leaving the ground. During the spring, the antagonist muscles again bend the joints, so that on next touching the ground it is at its maximum of flexion, again waiting to be unbent by the muscles that open the angles of the joint; and so on for ever, as the animal runs, it is thrown alternately from each foot in contact with the ground, as from a catapult, and advances by successive leaps or springs from foot to foot."

The length of its stride when bounding at full speed, as measured by Canon Tristram in the Sahara, varies from twenty-two to twenty-eight feet, and its rate of speed has been estimated by Dr. Livingstone at twenty-six miles an hour. He says:¹—"The ostrich when feeding has a pace of from twenty to twenty-two inches; when walking at other times, about four inches more. In general, the eye cannot follow its legs. I was once able to count the steps by a stop-watch, and if I am not mistaken, the bird made thirty strides

¹ "Missionary Travels in South Africa," p. 154.

in ten seconds. Reckoning each stride at twelve feet, we have a speed of about twenty-six miles per hour."

The ostrich is gregarious, although the flocks are not generally very large. Canon Tristram states¹ that the North African bird is less gregarious than that of the Cape, probably from the comparative scarcity of food; and that it generally lives in companies of from four to six individuals, which do not appear to be in the habit, under ordinary circumstances, of wandering more than twenty or thirty miles from their headquarters.

Shy and wild, the ostrich is able to travel an enormous distance when so inclined. During the day it knows no rest. Its whole nature seems indicative of haste and hurry, and it may frequently be met with far from any water, even in the hottest season, and in places where no green shrub or leaf is to be seen.²

Dr. Gosse states that in Senegal during the hot season the ostrich often bathes, but does not swim.³ Heuglin has remarked that on the coast of Abyssinia these birds frequently bathe in the sea, and on hot days may be seen standing for hours up to their necks in the water. The cry of the ostrich is deep, hoarse, and lugubrious, and in the stillness of the desert may be heard at a considerable distance. In the Scriptures this cry is termed a "wailing,"—*wébel kirnoth jaanah*, or, as in the Vulgate, *luctum quasi struthionum*. Canon Tristram has likened it to the hoarse lowing of an ox in pain.⁴ By others it has been likened to the roar of a lion.⁵

¹ The Great Sahara, p. 118 (1860).

² Finsch and Hartlaub, "Vögel Ost Afrikas," l. c.

³ Bull. Soc. Imp. Acclimat., 1858, p. 587.

⁴ Natural History of the Bible, p. 233.

⁵ Gosse, op. cit. 1857, p. 26.

The young are said to utter no cry. Dr. Sparrman, who took one with him from Honey Klip to the Cape, during twenty-four days never heard it emit any sound, even when by accident on one occasion his horse trod upon it.

In regard to food, the ostrich may be said to be omnivorous. Seeds, berries,¹ fruit, grass, leaves, beetles, locusts, small birds and animals, snakes and lizards, are all greedily devoured; while the trituration of the food is aided by quantities of sand, stones, grit, bones, and even pieces of metal, which are swallowed indiscriminately as opportunity occurs. So indifferent, indeed, does the bird seem to what is palatable or nourishing, that it is said to feed upon whatever it can swallow.² This indifference not unfrequently causes its death, since it takes into the system substances which are not only indigestible, but sometimes even poisonous. The stomach of an ostrich which died in the Zoological Society's Gardens, Regent Park, was found to contain, amongst other things, a number of copper coins to the value of 9½d. Many of these were much worn and defaced, but there is no doubt that they operated to cause the bird's death.³

The reproduction of the ostrich is a subject of some interest, and is one, moreover, on which some misconception seems still to exist, inasmuch as one continually meets with the oft-repeated statement that the eggs are laid in the bare sand, and are left by the bird to be hatched entirely by the heat of the sun.

¹ Amongst the seeds in the stomach of an ostrich, botanists have detected those of the askanit *Cenchrus echinatus*, and amongst berries those of the *Sodada decidua* and *Salvadora persica*.

² Fritsch, "Drei jahre in Süd-Afrika," p. 135.

³ See Proc. Zool. Soc. 1872, p. 357.

This is not quite correct, or, if it be the case in the warmest regions, it is otherwise in cooler latitudes. Indeed, by a remarkable instinct, the ostrich sits upon its eggs by night, when the cold would be too great for them, and leaves them to the sun's heat only during the day.

The following account of the discovery of an ostrich's nest in the Soudan by Mr. A. B. Meyers conveys a good idea of the bird's home and surroundings, and contains, moreover, some interesting particulars upon a subject to which African travellers, as a rule, have paid but little attention. In company with some brother officers, Mr. Meyers made a sporting tour in the Soudan during the winter of 1874-75, and the following extract is taken from their recently published journal.¹

Under date 18th March the writer says: "At an early hour one of our old friends, the ostrich-hunters, came to tell us that he knew where there was an ostrich nest, and that if we would give him good backsheesh he would take us to it. After a certain amount of squabbling, we came to reasonable terms, dependent on success or otherwise, and started off without delay on this novel expedition; and owing to the distance, and the consequent possibility of our being away all night, we provided ourselves with a limited supply of food and water, and with the friend of our dinner-table—the little whisky-barrel. A long ride over the high tableland in the direction of the Royan brought us evidently near our destination; but here arose a difficulty, for owing to the similarity of the ground, consisting of thinly-scattered mimosas and high grass, with here and there small spaces where it had been burned up, our guide

¹ "Life with the Hamran Arabs," by A. B. Meyers. 8vo, London, 1876.

wandered about for a long time before he could find the trees that were his landmark. When he succeeded in doing so, we tied up our horses, and tried to creep quietly along in line; but with the crackling of the grass at each step, this was impossible, and we had the disappointment of seeing a black ostrich rise from the nest and instantly disappear when we were a long way from it. We then went up to the nest, and found that it contained sixteen eggs, the proper complement being twenty-five, according to the Arab. The nest, if such it could be called, consisted merely of a very shallow depression in the hard-baked soil, in the centre of a small burnt-up patch of ground, surrounded by high grass, and though the eggs were closely packed together, they covered a considerable space. Vivian and myself were then carefully concealed in the grass on opposite sides of the nest to watch, and I was so thatched over that I could see literally nothing but the nest. After an hour of this very monotonous amusement, two visitors in the form of vultures pounced down upon the nest, and, apparently quite satisfied with the certainty of a quiet feast, commenced operations by a personal hunt amongst their own feathers; then a general survey was made of the white objects before them; and finally, having retired for a moment, each returned with a stone in its beak, and set to work to hammer a hole through the shell of an egg. But the talents of these experienced old thieves were not allowed to obtain their just reward on this occasion, for whilst thus occupied an ostrich was seen by Vivian approaching the nest, and he fired at it, but, wounded or otherwise, it made good its escape without being even seen by me, and the vultures also of course disappeared at the same moment. It was a pity

that the arrival of the ostrich should have so abruptly terminated this interesting *séance*. It was then useless watching any longer, and after our men's arrival and the robbery of two eggs, we retired to a little distance to enjoy a frugal repast of baked ostrich eggs, biscuits, and sardines."

The male ostriches, which are polygamous, fight vigorously in the breeding season for the possession of the females. Each cock-bird associates with three or four hens, all of which lay their eggs in one large nest scooped out in the sand, and relieve each other by turns at incubation. Le Vaillant purposely watched an ostrich's nest, and during the day saw four hens sit successively on the same eggs, a male bird coming late in the evening to take his turn at incubation. Each hen lays from a dozen to twenty eggs, but seldom sits upon more than sixteen. Incubation lasts six weeks, the cock-bird taking his turn at sitting like the hens. As the time draws nigh for the young to make their appearance, the male often becomes impatient, and has actually been observed to lean with his chest upon an egg, crack it, then take it up in his beak by the membrane inside the egg, and shake it violently until the young bird dropped out, when he would swallow the membrane and repeat the operation upon another.¹ The young run as soon as hatched, and are speedily able to shift for themselves. The parent ostrich behaves to its brood in much the same manner as does a domestic fowl with chickens, scraping the sand around, and searching for and breaking up their food for them.

Although each hen lays a large number of eggs in the

¹ See "The Field," 5th February 1876.

nest, many more are dropped in the neighbourhood, and it is asserted that these latter are broken by the parents as soon as the young are hatched, and serve for their first meals.¹

The remarkable difference which is observable in the texture of the shell in eggs from North and South Africa has already been noted.²

In taking the eggs from the nest, the natives, who esteem them a delicacy (if not indeed a necessary where other food is scarce), are careful not to touch any with the hand, but use a long stick to draw them out, so that the bird may not detect the smell of the intruder, and in consequence forsake the nest. Where this is skilfully managed, they return and lay again. Each egg weighs about three pounds, and is thus equal in bulk to about two dozen common hen's eggs.³

European travellers assert that an omelette made with an ostrich egg is exceedingly good eating. The natives generally cook an egg by setting it upright on a fire, and stirring it about with a forked stick which they insert through a hole in the end which is uppermost.

The shell, being thick and strong, is applied to various uses, but is chiefly turned to account as a vessel for water. Bush girls and Bakahari women who belong to the wandering Bechuana tribes of the Kalahari district, may be seen coming down to the fountains from their dwellings, each carrying on her back a kaross, or net, containing from twelve to fifteen eggshells, which have

¹ Layard, "Birds of South Africa," p. 281.

² See ante, p. 18.

³ The shell of the egg, as in the case of most birds, is composed chiefly of carbonate and phosphate of lime, the exact proportions of which are readily ascertainable by analysis. In addition, it contains a small quantity of gelatine, sulphate of lime, and chloride of potassium or sodium.

been emptied by a small aperture at one end; these they fill with water, tightly closing up the hole with grass. A group of women thus employed will be found depicted in Livingstone's "Missionary Travels in South Africa."

In the case of a bird whose plumes form so valuable an article of commerce, it is not to be wondered at that many and various methods should be devised for its capture.

In Arabia, as a rule, the bird is killed while sitting on its eggs. The hen, which in the breeding season is very reluctant to quit the nest, crouches down, and lowering its head and neck to the ground, fixes its eye motionless upon the approaching enemy. In this position, say the Bedouins, one must have a heart of stone to fire at the poor bird. But the love of gain prevails, and it is ruthlessly destroyed. As soon as it is killed, the hunter buries the blood, and laying the dead hen again on the eggs, digs a hole in the sand at a little distance, where he conceals himself until sunset, when the male returns, only to share the same fate.¹

Between Alexandria and Dernah, Minutoli found that the ostrich-hunters resort to the old device of the screen or stalking-horse, behind which they conceal themselves, and so cautiously steal upon the bird unawares. According to the geographer Strabo, the black tribe called by him *Struthophages*, from their practice of eating ostrich-meat, used to cover themselves with an ostrich skin, and thrusting the right arm into the skin of the neck, which they held aloft, by this device easily approached their game, and killed it.

This imitation bird is a perfect mimic of the real one, and at the distance of a hundred yards it is almost

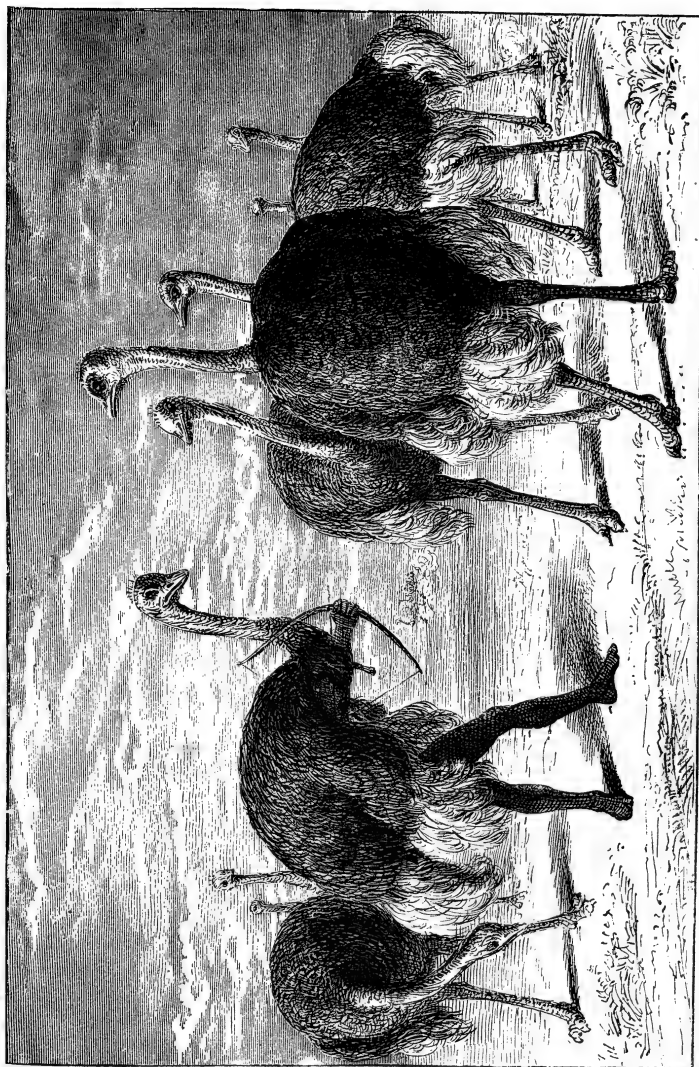
¹ Finsch and Hartlaub, "Vögel Ost Afrikas," p. 606.

impossible to detect the difference. Now it turns its head as if keeping a sharp look out; now it picks at the verdure on the ground, or at any water-melon or shrub which may be in its path; now it shakes its feathers, sometimes trotting and sometimes walking, until at length the wary bushman gets within bow-shot of some unlucky bird, and when, having discharged his arrow, one of the flocks run off in any direction, the sham bird runs off too. The rest of the flock are quite unable to understand why their comrade should suddenly run away and then lie down, and they allow the enemy to follow them up until they share the same fate. Several are often secured in this way before they get scent of the impostor.

The great difficulty on these occasions is to get to leeward of the flock, for if once a bird winds him, away they all go, and the trouble is taken for nothing.

In Morocco, according to Dr. Leared in his recently published work on that country,¹ "the ostrich is hunted by Arabs mounted on the desert horses already described. The party advance cautiously against the wind, and with long intervals between each horseman, until marks of the birds' feet are discovered. These are followed up until the birds themselves are discovered by the hunters. A dash at full speed is then made after the game, until the ostriches turn and face their pursuers. They do this because their pace, which is accomplished by a combination of flying and running, is interfered with by the action of the wind upon their wings. The gauntlet has then to be run among the armed sportsmen, who either shoot or maim the birds by throwing at their legs a

¹ Leared, "Morocco and the Moors," p. 308 (1876).



BUSHMAN STALKING OSTRICHES.



short thick stick formed of hard-grained and heavy wood. In the use of this implement the Arabs are extremely dexterous. When secured, the throats of the birds are cut and the feathers plucked off. These, and the flesh, which, although coarse, is eaten, are then divided among the hunters."

The mode of hunting the ostrich in other parts of North Africa has been well described by Hartmann in Cabanis' Journal, and, so far as the Sahara is concerned, by Canon Tristram in his work on the Great Sahara. Hartmann's statement that certain of the Bedouins hunt the ostrich on dromedaries is confirmed by the observations of Captain Burton, who says, that in Somali-land the natives hunt the bird on camels and shoot it with poisoned arrows.¹ In the Sahara it is ridden down on horseback, and its capture in this way, says Canon Tristram, is the greatest feat of hunting to which the Saharan sportsman aspires. "In richness of booty," he observes,² "it ranks next to the plunder of a caravan. But such prizes are not to be obtained without cost and toil, and it is generally estimated that the capture of an ostrich must be at the sacrifice of the life of a horse or two. So wary is the bird, and so vast are the plains over which it roams, that no ambuscades or artifices can be employed, and the vulgar resource of dogged perseverance is the only mode of pursuit. The horses undergo a long and painful training; abstinence from water as much as possible and a diet of dry dates being considered the best means for strengthening their wind. The hunters of the tribes to the east of M'zab

¹ Burton, "First Footsteps in East Africa," p. 163, note.

² "The Great Sahara," p. 117.

set forth with small skins of water strapped under their horses' bellies, and a scanty allowance of food for four or five days distributed judiciously about their saddles. As soon as the birds are descried, two or three of the hunters follow the herd at a gentle gallop, endeavouring only to keep the birds in sight, without alarming them or driving them at full speed, when they would soon be lost to view. The rest of the pursuers leisurely proceed in a direction at right angles to the course the ostriches have taken, knowing by experience their habit of running in a circle. Posted on the best look-out they can find, they await for hours the anticipated route of the game, calculating upon intersecting their path. If fortunate enough to detect them, the relay sets upon the now fatigued flock, and frequently succeeds in running down one or more, though some of their horses usually fall exhausted in the pursuit. The bird when overtaken offers no resistance beyond kicking out sideways. A skin in full plumage is worth on the spot from forty to a hundred Spanish dollars; but the Arabs are in the habit of judiciously thinning the feathers, so that the trader can rarely obtain a specimen on which this tax has not been previously paid."

The Bushmen, like the Somali-men, kill the ostrich with poisoned arrows, or catch it very cleverly in pit-falls, or with the lasso;¹ and the Sukurieh and Haden-dawah tribes likewise use the lasso, with which the bird, when once fairly caught, is strangled.² A favourite plan is to wait for the bird in a place of concealment as near as possible to the pools to which they come for water, and then with a gun loaded with swan-shot to

¹ Fritsch, "Drei jahre in Süd-Afrika," p. 291.

² Hartmann, "Journal für Ornithologie," 1863, p. 318; 1864, p. 154.

fire at their necks as they stoop to drink, when perhaps half-a-dozen are laid low at once.

Another plan to which the Bushman often resorts is simpler still. Having found an ostrich's nest, he removes all the eggs, and ensconcing himself in the nest, quietly awaits the return of the bird, which he shoots with a poisoned arrow before it has time to recover from its surprise at finding him there instead of its eggs. In Senaar the Abû-Rôf bring it down by throwing a curved and flat stick from two and a half to three feet long, not unlike the Australian boomerang, and made of tough acacia wood or hard zizyphus. Heuglin states that the Eisahirt people (Eisahirten) keep tame ostriches on purpose to hunt the wild ones (just as tame elephants are employed to hunt wild ones), and that they profess to charm the wild ostrich with the soft notes of a reed-pipe. The late C. J. Andersson, in his book on Lake Ngami, has given a spirited description of the mode in which he and Mr. Galton captured some young ostriches, which we will give in his own words:—

“Ostriches are at all times more or less numerous on the Naarip Plain, but more particularly so at this season, on account of the Naras being now ripe¹ . . . ; and in a part of the plain entirely destitute of vegetation we discovered a male and female ostrich with a brood of young ones about the size of ordinary barn-door fowls. This was a sight we had been long looking for, as Galton had been requested by Professor Owen to procure a few crania of the young of this bird in order to settle certain anatomical questions; accordingly we

¹ The fruit of a creeping desert plant, described by Andersson in his work on Lake Ngami, p. 21.

forthwith dismounted from our oxen and gave chase, which proved of no ordinary interest.

“The moment the parent birds became aware of our intention, they set off at full speed, the female leading the way, the young following in her wake, and the cock, though at some little distance, bringing up the rear of the family party. It was very touching to observe the anxiety the old birds evinced for the safety of their progeny. Finding that we were quickly gaining upon them, the male at once slackened his pace and diverged somewhat from his course; but seeing that we were not to be diverted from our purpose, he again increased his speed, and with wings drooping so as almost to touch the ground, he hovered round us, now in wide circles, and then decreasing the circumference till he came almost within pistol-shot, when he abruptly threw himself on the ground and struggled desperately to regain his legs, like a bird that has been badly wounded. Having previously fired at him, I really thought he was disabled, and made quickly towards him; but this was only a ruse on his part, for on my nearer approach he slowly rose and began to run in an opposite direction to that of the female, who, by this time, was considerably ahead with her charge.

“After about an hour’s severe chase, we secured nine of the brood, and though it consisted of about double that number, we found it necessary to be content with what we had bagged.

“On returning to the bay, however, the next morning in a mule-cart, Mr. Galton again encountered the same birds with the remainder of the family, and, after a short race, captured six more of the chicks.”

In Namaqua-land, says Andersson,¹ the following plan is adopted with considerable success:—

“A troop of ostriches being espied, a number of men unite and surround them; but the interval between the hunters is great, the cordon being drawn at such a distance beyond the birds (in fact, out of their sight) as not to arouse their suspicions. When a sufficient time has been allowed to enable the hunters to complete the circle, a general advance is commenced, the men taking care not to appear to direct their attention to the birds, but merely showing themselves in such a manner as to force them to give way. As a matter of course, the ostriches make off from the supposed danger, but only to encounter a fresh one, and thus rapidly become exhausted by a constant flight from one human being to another, whilst the hunters, as soon as they perceive that the chances of escape for the ostriches are at an end, take care to keep them moving at a rapid pace by shouting, yelling, and gesticulating violently. A very short time usually suffices to bring the exciting scene to a close by a general slaughter of the entrapped birds; and with experienced hunters this plan rarely fails to ensure success. The same people employ another method with even greater success: a whole tribe will join, mounted if possible on horseback; and the locality to be ‘drawn’ having been decided on, the body of horsemen station themselves across some pass, defile, or narrow part of a plain, whilst a few are despatched in search of the ostriches, and on their way station a comrade here and there at convenient intervals, and, having found their destined victims, the favourite haunts of which are well

¹ Andersson, “Birds of Damaraland,” edited by J. H. Gurney, 1872, p. 253.

known to them, gradually and cautiously begin to drive the unsuspecting birds towards their passive confederates. As soon as they have fairly succeeded in directing the course of the ostriches towards the desired quarter, they urge them on at a steady, telling pace ; and as the birds pass the mounted men who had been left behind at intervals, each of these successively takes up the pursuit, enabling the previous pursuer to drop behind and to allow his horse to recover its wind, whilst the ostriches, on the contrary, are never for a moment allowed to slacken their pace in their now headlong flight. The relieved hunters follow leisurely in an extended line or semicircle as the occasion may require, thus forming an effectual barrier to the retreat of the birds should they attempt such a course ; whilst the ostriches, by the time they reach the main body of horsemen, or even sooner, become so exhausted as to come to a dead halt or to fall helplessly to the ground, when the hunters slaughter them at leisure. It has thus happened that so great a number of ostriches have been entrapped and completely tired out, that, after as many had been killed as were required for food, the remainder, after being despoiled of their valuable wing and tail feathers, were suffered to depart without further injury."

When an ostrich is killed, every part of the bird is utilised. The first step is to remove the skin, so as to preserve the feathers uninjured ; the next is to melt the fat, which is poured into bags made of the skin of the thighs tied at the lower end. The grease of a bird in good condition will fill the skin of both legs, which hold about four gallons. Not only is it eaten with bread, and used in the preparation of "kooskoosoo" and other food, but the Arabs regard it as a useful application in certain

maladies. In all cases of rheumatism and acute pains it is used by being well rubbed in, and the parts affected are then covered with heated sand.

Those who have tasted ostrich-meat state that it is both wholesome and palatable, although, as might be expected in the case of wild birds, it may be somewhat hard and tough. Where the birds have been domesticated, however, and fed on lucerne, clover, and grain, the meat becomes juicy and tender.

Notwithstanding its prohibition by the Jewish legislature, it would seem that ostrich-meat was not unfrequently consumed in former times. Firmus, one of the kings of Egypt, it is said, used to dine off ostrich; and according to Lampridius, the Emperor Heliogabalus, on the occasion of a great feast, caused the brains of six hundred ostriches to be served up in one dish. It is related of Leo Africanus that he partook of ostrich-meat in Numidia, where, it is said, young ostriches were then fattened expressly for the table. But whatever may have been the case formerly, this statement does not appear to have been confirmed by any recent traveller. Strabo, as already mentioned, gives a curious account of the Struthophages, a black tribe on the Upper Nile, who hunted and lived upon ostriches, and clothed themselves with the skins of this bird.

A recent observer, Canon Tristram, has remarked that the Arabs of the present day eat ostrich-meat, and that he himself has tasted it, and found it palatable enough. This opinion, too, is shared by Hartmann.¹

Mr. John Parkes, of Wheatlands, Cape Colony, reports that last year (1875) he had a troop of seventy ostriches

¹ "Journal für Ornithologie," l. c.

feeding in the veldt. On one occasion an antelope suddenly jumped up in their midst, and they took fright. Whilst running at full speed, one of the birds put his foot in a hole and broke his leg. The poor bird lay there all night, and next morning Mr. Parkes brought him to the homestead in his cart. Finding it impossible to set the bone, the bird was killed, and the meat converted into steaks and "biltong." It was said to eat "just like young beef, juicy and tender, with just a suspicion of a sweetish flavour, usually undiscoverable in the legitimate article." So long, however, as the present value of ostrich feathers is maintained in the English and French markets, it is not likely that many birds will be killed for the sake of the meat alone.

As we shall have occasion later on to deal fully with the subject of ostrich-farming, it will be unnecessary here to dwell upon the subject of ostrich plumes and their value. Suffice it to say, that in the case of wild birds the feathers are said to differ in quality, according to the locality whence they are obtained. Those of the well-watered and luxuriant districts are long and heavy, but stiff and ungraceful, owing to the thickness of the quills; whilst those of the Kalahari, and the adjoining countries, are shorter, lighter, and superior, having finer quills, which allow the feathers to droop in a graceful curve.¹ It appears to be generally admitted that the feathers produced by domesticated or artificially reared birds are always inferior to those of wild ones.

From time to time experiments have been made with a view to test the capability of the ostrich in drawing and carrying burdens, but probably more from curiosity

¹ Fritsch, "Drei jahre in Süd-Afrika," p. 291.

or for amusement, than with any real intention of turning the bird's powers in this respect to account. According to Montaigne,¹ "L'Empereur Firmus fait mener son coche à des autruches de merveilleuse grandeur, de manière qu'il semblerait plus voler que rouler."



Ostrich-Car.

Dr. Sparrman, a century ago (1775), saw mounted ostriches at the Cape;² and before him, Moore had recorded his having seen an Englishman at Joar travelling long distances upon a bridled ostrich.³ Adanson speaks of the ease and rapidity with which a large tame ostrich ran, first with two little blacks, and then with two full-grown negroes on its back, while a smaller bird, with equal facility, carried a single full-grown man.⁴

The late Mr. Blyth informed us that ostriches from

¹ "Essais," liv. iii. chap. vi.

² "Voyage to the Cape of Good Hope," 1786.

³ "Travels into the Inland Parts of Africa," 1738.

⁴ "Voyage to Senegal, the Isle of Goree, and the River Gambia," 1759.

North Africa are frequently offered for sale in Calcutta, and that some years ago in the gardens of the Maharajah of Burdwan he saw one mounted by a boy. In the Jardin d'Acclimatation in Paris, at the present day, a gentleman, well known in the naturalist world, may occasionally be seen amusing himself by driving a little car drawn by an ostrich.

At what date ostriches were first introduced into England we cannot with certainty state. Sir Thomas Browne of Norwich, writing to his son in London in August 1680, says¹—"Wee heare of two oestriges wch are brought from Tangier. I sawe one in the latter end of King James his dayes, at Greenwich, when I was a schoolboy. Later on he adds,² "Mr Clarke tells mee hee sawe 2 ostridges in London in Cromwell's time."

In a subsequent letter, dated 9th January 1682, he observes³—"A great part of our newes is of the King of Fez and Morocco's embassadour, with his presents of lyons and oestridges;" at which date, "there being so many oestridges brought over, 'tis likely some of them will be brought about to shoue hither [*i.e.*, to Norwich], as soone as other parts out of London."

His son kept one alive for some time. When it died he dissected it, and, in a letter to his father, "set downe what he observed on the dissection."⁴ Sir Thomas refers to this as "being, I think, the first oestridge dissected in England, at least to any purpose.

¹ Sir Thomas Browne's "Works." Edited by Simon Wilkin, vol. i. p. 281.

² Op. cit., vol. i. p. 334.

³ Op. cit., p. 323.

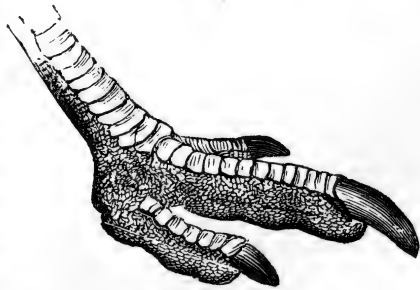
⁴ Op. cit., p. 456.

CHAPTER II.

*THE RHEA, OR SOUTH AMERICAN OSTRICH—**Rhea americana*, LATHAM.

In what respects it differs from the African bird—Three species of the genus now recognised—Their geographical distribution—The common rhea—Its habits—Power of swimming—Its cry—Nesting and reproduction—Food—Mode of hunting—Numbers annually killed for their feathers—Quantity and value of feathers exported to the United States and Europe—Statistics from the British Consul at Buenos Ayres—The like from M. Carel, of Havre—M. Vavaseur's Report—Acclimatisation of the rhea in European countries—France, Germany, and England.

THE members of the genus *Rhea*, as before remarked, differ conspicuously from *Struthio*, in having the head and neck completely feathered, in possessing no tail, and in having three toes instead of two. The wings also are more developed than in the true ostrich, and are adorned with long slender plumes.¹



Foot of the Rhea.

Three distinct species of this genus are now recognised by naturalists as inhabiting the New World: the

¹ For details of internal structure, the scientific inquirer may be referred to Dr. Houghton's description of the muscular anatomy (Proc. Roy. Irish Acad., vol. ix. p. 497), Mr. Parker's elaborate paper on the skull in the ostrich tribe (Phil. Trans., 1866, pp. 113-183), and Dr. Cunningham's account of the osteology (Proc. Zool. Soc., 1871, p. 105).

Common Rhea, *Rhea americana*; Darwin's Rhea, *R. darwini*; and the Long-billed Rhea, *R. macrorhyncha*.

The first of these, which, it is almost unnecessary to state, was for a long period the only species of the genus known, appears to possess the widest geographical



The Common Rhea.

range, extending, according to Dr. Cunningham (Pro. Zool. Soc., 1871, p. 105), from Bolivia, Paraguay, and South Brazil, at least as far south as the Strait of Magellan,¹ a space of upwards of thirty degrees. The second was first scientifically described by Mr. Gould in the "Proceedings" of the Zoological Society for 1837, from a specimen procured by Mr. Darwin at Port Desire, on the east coast of Patagonia, and probably extends

¹ Dr. Cunningham, in the article above quoted, says that it may be regarded as certain that a species of rhea occurs to the south of the Strait, in the large eastern island of Tierra del Fuego, the northern portion of which is almost identical in its climate and physical characters with those of Eastern Patagonia; but whether it be referable to *R. americana* or *R. darwini*, he is unable to say.

from the Strait of Magellan to the Rio Negro, the boundary line between Patagonia and the Argentine Republic; while, for our knowledge of the third, the precise habitat of which remains to be determined, we are indebted to Mr. Sclater's finely illustrated article on the Struthious birds living in the Zoological Society's Gardens, published in 1862 in the fourth volume of that Society's "Transactions."

In assigning such an extensive range as above indicated to *Rhea americana*, Dr. Cunningham admits that his views conflict with those of Mr. Darwin, who fixes the southern limit of this bird at a little to the south of the Rio Negro, observing that *R. darwini* takes its place in Southern Patagonia. Dr. Cunningham, however, is able to assert positively that *R. americana* extends as far south as the Strait of Magellan, inhabiting the same tracts of country as the latter species; for in the course of his sojourn in the eastern portion of the Strait he saw a number of recently killed specimens in the possession of the Patagonian Indians; and although he did not see any examples of *R. darwini* in the flesh, he picked up its characteristic white-tipped feathers in various localities in the plains.

The ordinary habits of the South American ostrich are thus described by Mr. Darwin :¹—

"They live on vegetable matter, such as roots and grass; but at Bahia Blanca I have repeatedly seen three or four come down at low water to the extensive mud-banks, which are then dry, for the sake, as the Gauchos say, of feeding on small fish. Although the rhea in its habits is so shy, wary, and solitary, and although so

¹ Naturalist's Voyage Round the World, pp. 89-92.

fleet in its pace, it is caught without much difficulty by the Indian or Gaucho armed with the 'bolas.' When several horsemen appear in a semicircle, it becomes confounded, and does not know which way to escape. They generally prefer running against the wind; yet at the first start they expand their wings, and like a vessel make all sail. On one fine hot day I saw several rheas enter a bed of tall rushes, where they squatted concealed till quite closely approached. It is not generally known that these birds readily take to the water. Mr. King informs me that at the bay of San Blas, and at Port Valdes in Patagonia, he saw them swimming several times from island to island. 'They ran into the water both when driven down to a point, and likewise of their own accord when not frightened; the distance crossed was about two hundred yards.¹ When swimming, very little of their bodies appear above water; their necks are extended a little forward, and their progress is slow. On two occasions I saw some rheas swimming across the Santa Cruz river, where its course was about four hundred yards wide, and the stream rapid. Captain Sturt,² when descending the Murrumbidgee, in Australia, saw two emus in the act of swimming.

"The inhabitants of the country readily distinguish, even at a distance, the cock-bird from the hen. The former is larger and darker coloured,³ and has a bigger

¹ This observation is confirmed by Dr. Cunningham, who states that one of the officers of the "Nassau," to which vessel he was attached as naturalist, saw several of these birds on the southern shore of St. Jago Bay, Strait of Magellan, escape from threatened danger by running into the sea.

² Sturt's Travels, vol. ii. p. 74.

³ A Gaucho assured me that he had once seen a snow-white or albino variety, and that it was a most beautiful bird.



THE RHEA, OR SOUTH AMERICAN OSTRICH, *Rhea Americana*.



head.¹ The rhea, I believe the cock, emits a singular, deep-toned, hissing note: when first I heard it, standing in the midst of some sand-hillocks, I thought it was made by some wild beast, for it is a sound that one cannot tell whence it comes, or from how far distant. When we were at Bahia Blanca in the months of September and October, the eggs, in extraordinary numbers, were found all over the country. They lie either scattered and single, in which case they are never hatched, and are called by the Spaniards *huachos*; or they are collected together into a shallow excavation, which forms the nest.² Out of the four nests which I saw, three contained twenty-two eggs each, and the fourth twenty-seven. In one day's hunting on horseback sixty-four eggs were found; forty-four of these were in two nests, and the remaining twenty scattered *huachos*. The Gauchos unanimously affirm, and there is no reason to doubt their statement, that the male bird alone hatches the eggs, and for some time afterwards accompanies the young. The cock when on the nest lies very close; I have myself almost ridden over one. It is asserted that at such times they are occasionally fierce, and even dangerous, and that they have been known to attack a man on horseback, trying to kick and leap on him. My informer pointed out to me an old man whom he had seen much terrified by one chasing him. I observe in Burchell's 'Travels in South Africa,' that he remarks, 'Having killed a male ostrich, and the feathers being dirty, it was said by the Hottentots to be a nest-bird.'

¹ In its natural attitude, the common rhea stands about five feet high, or about two feet lower than the African ostrich.

² This observation is confirmed by Dr. Cunningham in his "Natural History of the Strait of Magellan," p. 134.

I understand that the male emu in the Zoological Gardens takes charge of the nest: this habit, therefore, seems common to the family.

“The Gauchos unanimously affirm that several females lay in one nest. I have positively been told that four or five hen-birds have been watched to go, in the middle of the day, one after the other, to the same nest. I may add, also, that it is believed in Africa that two or more females lay in one nest.¹ Although this habit at first appears very strange, I think the cause may be explained in a simple manner. The number of eggs in the nest varies from twenty to forty, and even to fifty; and according to Azara, sometimes to seventy or eighty. Now, although it is most probable, from the number of eggs found in one district being so extraordinarily great in proportion to the parent birds, and likewise from the state of the ovarium of the hen, that she may in the course of the season lay a large number, yet the time required must be very long. Azara states,² that a female in a state of domestication laid seventeen eggs, each at the interval of three days. If the hen was obliged to hatch her own eggs, before the last was laid the first probably would be addled; but if each laid a few eggs at successive periods, in different nests, and several hens, as is stated to be the case, combined together, then the eggs in one collection would be nearly of the same age. If the number of eggs in one of these nests is, as I believe, not greater on an average than the number laid by one female in the season, then there must be as many nests as females, and each cock

¹ Burchell's "Travels in the Interior of Southern Africa," vol. i. p. 280. See ante, p. 41.

² Azara's "Voyages dans l'Amerique Méridionale," vol. iv. p. 173.

will have its fair share of the labour of incubation ; and that during a period when the females probably could not sit, from not having finished laying.¹ I have before mentioned the great numbers of *huachos* or deserted eggs, so that in one day's hunting twenty were to be found in this state. It appears odd that so many should be wasted. Does it not arise from the difficulty of several females associating together, and finding a male ready to undertake the office of incubation ? It is evident that there must at first be some degree of association between at least two females, otherwise the eggs would remain scattered over the wide plains at distances far too great to allow of the male collecting them into one nest. Some authors have believed that the scattered eggs were deposited for the young birds to feed on.² This can hardly be the case in America, because the *huachos*, although often found addled and putrid, are generally whole."

Captain Burton, during his travels in the "Highlands of Brazil," seems to have seen this bird but once in a wild state. On the banks of the Corrente river, opposite the island of Santo Antonio, he says, "An ostrich appeared pacing along the shore, but the people here have not yet [Oct. 1867] learned to kill it for its feathers."³ In a footnote to this passage he adds, "The Welsh colony in Patagonia are buying, I am told, ema⁴ feathers for

¹ Lichtenstein, however, asserts (*Reisen im Südlichen Afrika*, vol. ii. p. 25) that the hens begin sitting when they have laid ten or twelve eggs ; and that they continue laying, I presume, in another nest. This appears to me very improbable. He asserts that four or five hens associate for incubation with one cock, who sits only at night.

² This is asserted also of the African ostrich. See ante, p. 42.

³ "The Highlands of Brazil," vol. ii. p. 296 (1869).

⁴ Captain Burton intimates that the name of this bird should be written

threepence per pound, and expect to sell them in England for thirty shillings. In these civilised days, when no head requires to wear the colours which nature gave it, surely the grey plume of the American bird may, by bleaching and dyeing, be made to pass for an African one."

In penning this remark, Capt. Burton was evidently unaware of the difference which exists in the structure of these feathers, which, independently of colour, would enable their identification by the connoisseur.

The rhea, like other members of the ostrich family, is a very indiscriminate feeder, lives chiefly on grass, seeds, and locusts; but, according to Dr. Cunningham, it appears to have a special predilection for the red berries of the *Empetrum rubrum*, a plant which is very abundant on the grassy plains where this bird is found.

Mr. C. S. Smelt, late of the 98th Regiment, writing on "Emigration to the River Plate,"¹ and describing the province of Buenos Ayres, says:—

"About eight years ago (1868), when I first came to this part of the country, in addition to deer, we had at times, and more especially after the Indians had been hunting on the outside camps, a very fair show of the South American ostrich. These we used to hunt with some half-bred greyhounds that we had managed to pick up in the town of Buenos Ayres; and it is difficult to

ema and not *emu*. He says (op. cit., vol. i. p. 52, note), "In the province of Rio Grande the word *avestrus*, properly the African ostrich, is used. *Ema* is a corruption of the Arabic *Néamah*, yet even the accurate Southey (vol. i. p. 129) and Gardner, to say nothing of the vulgar herd, have corrupted it to *emu*. The aborigines of the Brazils called it *Nhandú* or *Nhundú*. According to Prince Max (vol. iii. p. 12) the Brazilians also know it as *Touyou*, and Southey adds *Churi* (vol. i. p. 253). I have not heard either of these words, which are pure Guarani."

¹ "The Field," 24th June 1876.

conceive anything more exciting than a run after one of these birds. Their speed is astonishing; they almost invariably run down and side on to the wind, and, if there is a good stiff breeze blowing, as is almost always the case on these pampas, they raise one wing, which acts as a kind of sail, and when this happens few horses or dogs can live with them, and it is only by fairly wearing them out that they can eventually be approached. To succeed in this, however, both horses and dogs must be in excellent condition. I have often seen runs that lasted for an hour and a half and more, and the pace was almost always most trying, and, although there are no fences to be negotiated, the riding is far from being easy or free from danger, as frequently large tracts of country have to be crossed which are entirely covered with tufts of high coarse grass, where it is all blind going, and again in other parts the ground is full of holes, and undermined by bizcachas, foxes, and other animals, and it is only the wonderful cleverness of the horses, which are thoroughly at home in this kind of ground, and very rarely ever make a mistake, that prevents many awkward accidents from happening. Frequently, however, one gets a run over as fine turf as any man would wish to ride over, where the ground is perfectly sound, and nothing is to be met with to prevent the most perfect enjoyment of the sport.

“The natives and the Indians never hunt any kind of game with dogs, they always use the ‘bolas’ or balls. These are three pieces of lead, or hard heavy wood, or stone, rudely fashioned into a round shape, cased in raw hide, and attached to thongs of the same material, which are joined together in the centre. In using them they are swung round the head with great rapidity whilst

the horse is going at full speed, and, when within throwing distance, are launched at the game, when they twist round its legs, head, or wings, and completely cripple it, and often stun it if one of the balls happens to strike the head or any sensitive part. The distance to which these can be thrown, and the wonderful precision which is exhibited in their use, is quite marvellous. I have seen cattle and horses stopped at a distance exceeding eighty yards, their hind legs having been firmly tied together by the winding of the balls round them. For cattle, of course, much larger balls are used than for deer and ostriches; for the former they are about the size of a man's fist when clenched, and for the latter a little larger than pigeons' eggs. It is a peculiarity of the ostrich that when hard pressed it will squat amongst the high grass, or any sort of covert that it can get to, and lie so close that it is almost impossible to find it, as the dogs usually overrun it some distance before the mistake is discovered; in this way we lost many that were dead beaten, and, though we knew that they were close to us, we almost invariably failed to find them. In running them, when the dogs get alongside of them, it is wonderful to see the manner in which they double, just as a hare does before greyhounds, but apparently shorter, and with greater ease, if such a thing be possible."

On the pampas in the district of Tapalqueen on the south-western frontier of Buenos Ayres, the rhea is tolerably numerous, and here the same writer had some excellent sport in coursing it.

The country which it inhabits he describes as "a rolling prairie, or pampa, as it is called in South America, a regular succession of hill and dale, in fact, that looked

(so perfectly uniform was the undulation), exactly like the long rolling swell of mid-ocean after a heavy gale of wind. Not a tree to be seen, no water—save now and again a muddy puddle, like a duck-pond in England—and scarcely a hut; almost the only signs of life, except the ostriches, being the small burrowing prairie owls.” “We soon found,” says Mr. Smelt, recounting his experiences,¹ “that the report we had heard as to the abundance of ostriches here had not been exaggerated, and that in whatever direction we went, we were sure of finding them. After riding for about a mile and a half, we viewed five birds feeding in a hollow at a distance of about seven or eight hundred yards from us, and discovered that by skirting some high grass to our left we should most probably be able to get close to them without alarming them; so we at once started in that direction, taking two of the dogs with us.

“Before we had gone a couple of hundred yards, we came suddenly on an old male bird, a splendid fellow, and we slipped the dogs within five-and-twenty yards of him. Then began one of the most exciting runs it was ever my good fortune to witness. Away we went through the thick ‘pajas,’ or tufts of high reedy grass, the hounds keeping well up, and apparently rather gaining ground than otherwise. In this way we ran for two miles or more, when the ostrich, emerging from the high grass, steered away across some bare hills, where he got the full force of a very fresh breeze that was blowing at the time, of which he at once took advantage, running down and across it in an oblique direction with

¹ “Deer and Ostrich Hunting in the Province of Buenos Ayres,” “The Field,” 22d July 1876.

his left wing raised, which he made use of as a sail. The pace hitherto had been good—in fact, I may say, without fear of exaggeration, more than good ; but now that he had got the wind, it was simply racing, and, in spite of all our efforts and those of the dogs, he seemed to leave us literally as though we were standing still. We kept pounding away, however, in pursuit as well as we could for some time, when a man who was driving cattle turned him to the right, and he headed straight back towards us for a few seconds before he found out his mistake ; we were thus enabled to get on good terms with him again. After running for about fifteen minutes more, he began to show unmistakable signs of distress, and one of the dogs, a large brindled one, ranged fairly alongside, and was about to make a spring, when he doubled as short as if he had been fixed on a movable pivot, and catching the slant of the wind, and setting his wing again, he was off like a flash of lightning, and leading by nearly a quarter of a mile, the hounds having shot lengths ahead in another direction before they could turn. It was evident, however, that he was tiring fast, and, although the pace was still good, we got alongside again, but with no better result than another double and another good lead for the bird ; and these tactics he continued to repeat each time we neared him, always gaining an immense advantage thereby. It became plain, however, that he could not last much longer, and eventually the dogs pinned him, when we rode up and gave him his *coup de grâce*, cutting off his wings as trophies. He was a noble bird, and a most gallant struggle he made for his life, and I feel quite certain that if he had not been turned by the cowherd he would have made good his escape, for both dogs and horses, and their riders too,

were pretty nearly pumped out when that happened. The time was over an hour, and a good part of it at racing pace, and the panting sides and distressed looks of our animals told us plainly enough that it was useless to think of looking for more game till we had got fresh cattle; so, after allowing a short breathing time, and lighting our pipes, we turned homewards well satisfied with our morning's sport.

“In the afternoon we made up our minds to try our luck again; so about three o'clock we sallied forth with fresh horses and dogs, and after a ride of nearly a league, had a find, and were fortunate enough to slip our dogs to a very good start. The bird, which was a full-grown one, and seemingly as large as the one we had killed in the morning, led us at a splitting pace for a good five miles across very fine open camp, when he turned to a large tract of ‘pajas,’ through which we followed him for about fifteen minutes, when I and my friend both came to terrible grief at very nearly the same moment. An evil fate had led us across a place which a colony of bizcachas had inhabited at some former time, and before we knew it we were in the middle of their holes, which were completely hidden by the grass, and our horses, being by this time pretty well blown, came down on their heads, depositing each of us gracefully on mother earth. This finale was ludicrous, but extremely aggravating. However, there was nothing for it but to take things quietly, as by the accident we were hopelessly thrown out, even if we could have seen the course, which the height of the grass rendered impossible; so we sat down, and lighting our pipes, waited to see what would turn up, and in about half an hour the dogs returned, dead beaten, but evidently without having

killed. Most probably the ostrich was lying down hidden in some thick covert, as these birds frequently do when hard pressed, and the hounds had overrun him. So ended our first essay at ostrich-hunting in this part of the country; and most delighted we were with it, notwithstanding its rather ignominious conclusion.

“ We spent several more days in pursuit of the same game, on one occasion killing three, whilst on another we had a run for nearly two hours after a splendid bird over frightfully bad ground, almost all of it being blind going. Our horses, however, never made a mistake. The pace was quite as good as we liked, sometimes rather better; and we had hunted our quarry very nearly to a standstill when we lost him in a most mysterious manner, and although we beat most carefully all round, we never found him again. Of course he was skulking in the long grass somewhere close to us, and possibly we might almost have trodden on him several times; but he never made a move, and we were eventually compelled by the darkness to relinquish our search in despair. We succeeded altogether in bagging eleven ostriches, although of course we hunted many more, which, notwithstanding that our horses were good and in excellent condition, we were unable to give an account of. This, however, is no matter for surprise, when one takes into consideration the enormous speed they exhibit when they catch a good wind, and their inveterate habit of skulking in thick grass when hard pressed. Their usual mode is to run slantwise across the wind with one wing set sail-fashion; but I have repeatedly seen them run dead before it with both raised, much in the same manner as a swan sets his wings when swimming before a gentle breeze.”

From its hardy nature and omnivorous habits it is easily kept in confinement. Dr. Cunningham, when visiting the Governor at Punta Arenas, or Sandy Point, Patagonia, saw two young rheas which had been turned into an enclosure. At the date of his visit they had just succeeded in making their escape, and rushing up and down the kitchen-garden, pursued by the Governor's secretary, furnished a most laughable spectacle; for, apparently determined to improve their unwonted opportunities to the uttermost, they ran about snapping off the heads of the young cabbages and potatoes.¹

Captain Burton states² that in the grounds of the Comendador Ferreira Lage at Juiz de F6ra, he saw several of these birds in captivity; and there can be no doubt that were ostrich-farming carried on in South America as in Cape Colony, it might be made a most profitable business. Unfortunately, it would seem that at present few persons in South America have given the matter much attention, and, as a rule, the feathers, which are largely exported to the United States and Europe, are plucked from birds which have been killed by hundreds for the purpose. So great has been the slaughter during the last few years, averaging, as we are informed, from 300,000 to 500,000 per annum, that one may now ride hundreds of leagues from Buenos Ayres without seeing one.³

Mr. Ronald Bridgett, Her Majesty's Acting Consul at

¹ Cunningham, "Natural History of the Strait of Magellan," p. 98.

² "The Highlands of Brazil," vol. i. p. 52.

³ From another source we learn that for some years back the number of birds killed has averaged 400,000 per annum, and, as a consequence, the species has already disappeared from nearly half the territory of the River Plate.

Buenos Ayres, writing to us under date 14th March 1876, says:—

“The American ostrich, or rhea, only exists in this province beyond the Indian frontier, while it is plentiful in the provinces of Entre Rios, Santa Fé, and Cordova. It exists in large numbers in the adjoining republic of Uruguay, but nowhere is it ‘farmed,’ except on the most modest scale. The meat is palatable, and frequently eaten when beef or mutton is not attainable.

“The birds lay from twenty to thirty eggs in a nest, and these are commonly hatched by the male. The eggs are very good eating, as I know from personal experience.”

In another letter, dated 3d June 1876, the same gentleman writes:—

“The ostrich of these countries is of an inquiring turn of mind. When one of a flock is killed, the others do not take themselves off, but remain near their dead companion. I have attracted them within gunshot by lying on my stomach and moving my legs slowly in the air, when the birds come up cautiously to see what the moving object can be.”

Through the kindness of Mr. Bridgett we have been favoured by Mr. Richard Newton of Buenos Ayres with the following additional information:—

“The American ostrich is found in most parts of the Argentine and Uruguay Republics, whether sandy, flat, or hilly, but seems to prefer grassy country with cover. It lives on grass, seeds, and vegetables, and is very fond of locusts. The natives and Indians hunt them, and some foreigners shoot them. The natives and Indians are very fond of wild ostrich-meat. The eggs also are

good eating, and vary from a pound and a half to a pound and three-quarters in weight. The birds are easily reared and domesticated, but are apt to wander away at breeding-time if not looked after. It has been found that if the eggs are taken about a fortnight before hatching, and put in boxes wrapped up in wool in a room, they will hatch very well without the loss of a single one. There is no ostrich-farming on the River Plate, except on a small scale, for the sake of the eggs. The law here prohibits the killing of birds during the breeding season, but unfortunately it is almost a dead letter. The annual slaughter (as before remarked) is enormous."

The export tables of 1874 show the quantities and value of ostrich feathers despatched from Argentine ports during the year to be as follows:—

			Tons.	Value.
To the United States,	...	...	19	\$41,674
„ France, ...	...	...	18	39,873
„ England, ...	...	...	2	5,453
„ Other Countries,	...	...	21	45,689
			<hr/> 60	<hr/> \$132,689

The valuation is at the rate of a dollar, or four shillings, per pound. Owing to the slaughter of the birds, there has been a marked decline in the exportation of feathers. For example, the export from the single Custom-house of Buenos Ayres in 1872 was sixty-one tons, whereas in 1874 it fell to forty-six tons.

In 1872 the trade with England was four times greater than in 1874.

M. Carel, of Havre, one of the largest importers of South American ostrich feathers, has most obligingly furnished us with the following additional details:—

"We receive annually," he says, "about 35,000 kilos, which represents in value about 1,200,000 francs, or £48,000. Of this quantity, about half is ordinarily exported. These feathers, which come from Banda Oriental, Bahia Blanca, Entre Rios, and in smaller quantities from Patagonia, arrive here in the same state as when they reach the markets at Monte Video and Buenos Ayres. They are packed by the natives, but it sometimes, although rarely, happens that a particularly fine parcel is sorted and re-packed at the port whence it is shipped. I do not know what quantity is sent direct from La Plata to New York, but I imagine it must be much less than what we receive here."

Although the rhea is commonly termed the South American ostrich, and quite as erroneously the emu, its feathers are known in the trade as *Vautour*, to distinguish them from those of the African bird. The white and half-white ones are called *gerbes Indiennes*, or Indian sheaves; the dark-greys, which are by far the most numerous, are tied up in bundles, and sold as feather-brooms.

The notion of acclimatising the rhea in Europe was long ago mooted, and attempts have been made from time to time, which have proved more or less successful. M. Vavaseur made the experiment in France, and reported that there was no difficulty in domesticating it. Having spent fifteen years in the interior of the republic of Uruguay, where the bird was at that time common, he had ample opportunities of making himself acquainted with its habits and mode of life. His account of the species, which was published¹ with a view to the domes-

¹ "Bulletin de la Société d'Acclimatation," 1858, pp. 388-394. See also Schmidt, "Beobachtungen über den Americanischen Strauss" in "Der Zoologische Garten," 1866, pp. 8-14, and Fitzinger, *op. cit.*, pp. 131-133.

tication and acclimatisation of the bird in France, is so full of information derived from personal observation of the species in a wild state, that we cannot do better than furnish the reader with the following extracts :—

“Les savanes immenses et tout à fait plates de la république Argentine (*Pampas*), celles des provinces d'Entre-Rios et de Corrientes, et les plaines ondulées de la république de l'Uruguay sont les lieux où se trouve plus communément cet oiseau, qui, au contraire, est rare au Paraguay.

“Les bandes de nandous (*bandadas de Avestruzes*) se composent de dix, quinze et quelquefois jusqu'à vingt femelles conduites par un seul mâle (*el gallo*), qui marche presque toujours à leur tête, et facile à reconnaître à sa taille un peu plus grande et à la couleur noire plus foncée des plumes du poitrail et de la base des ailes. Ces troupes, qui ne se mêlent jamais entre elles, se rencontrent à chaque pas dans la campagne, marchant gravement en cherchant leur nourriture au milieu des bœufs, des chevaux, des moutons et des cerfs, avec lesquels elles vivent dans la meilleure intelligence.

“Dans les pays où on ne leur donne pas habituellement la chasse, comme dans la république de l'Uruguay et dans les campagnes de Buenos-Ayres, ces oiseaux ne se dérangent pas à la vue des gens à pied, et viennent paître sans manifester la moindre crainte autour des habitations. Cependant, s'ils découvrent un ou plusieurs cavaliers et s'ils s'aperçoivent qu'on cherche à les surprendre, ils prennent la fuite de très loin, et avec une vitesse extrême. Mais dans les lieux où l'on a coutume de les poursuivre, comme dans les Pampas, où les Indiens les chassent habituellement, ils sont constamment en

défiance, et ne se laissent jamais approcher que par surprise.

* * * * *

“ L'autruche d'Amérique est douée du naturel le plus pacifique et le plus timide. Elle est, dans le pays, prise pour type de la bêtise, et son nom, *Avestruz*, est libéralement appliqué, surtout par les femmes, aux individus peu favorisés du côté de l'intelligence. Cependant, si pacifique que soit cet oiseau, on voit quelquefois les mâles, chefs de famille, se livrer des combats furieux, soit pour défendre leurs femelles, soit pour en enlever quelques-unes à d'autres bandes. Ils combattent à coups de pied : ces combats ont quelque chose de risible, à cause des mouvements bizarres, désordonnés et ridicules que font en face l'un de l'autre les deux adversaires. Attaqués par l'homme, les Nandous n'opposent jamais de résistance et cherchent leur salut dans la fuite. Ce n'est que lorsqu'ils se voient forcés qu'ils pensent à se défendre en lançant à leur ennemi de violents coups de pied. La force en est telle, qu'un seul coup peut casser un membre ; comme je l'ai vu chez un jeune homme de quinze à seize ans, qui eut les deux os de la jambe rompus d'un coup de pied d'une autruche blessée dont il s'était approché sans précaution.

La fin de l'hiver (juillet et août dans l'autre hémisphère) est l'époque des amours des nandous. On entend alors, de tous côtés dans la campagne, une sorte de ronflement sourd, qu'on ne saurait mieux comparer qu'à celui que produit le jouet, si à la mode autrefois, connu sous le nom de *diable* ; seulement il est beaucoup plus fort. C'est le cri d'appel du mâle. Vers la fin d'août, on commence à trouver çà et là, sur l'herbe, des œufs isolés que les gens du pays appellent *guachos*, et qu'ils

assurent provenir de jeunes femelles à leur première ponte. Le nid ne consiste qu'en un trou large, peu profond, à fond arrondi, creusé dans la terre. On croit généralement, et je partage cette opinion, que l'oiseau ne se donne pas la peine de façonner ce trou, mais qu'il profite de ceux que creusent dans la campagne, avec leurs pieds de devant, les taureaux, pour en tirer des nuages de poussière dont ils aiment à s'envelopper. Le nombre des œufs qu'on rencontre le plus ordinairement dans ces vastes nids est de vingt-cinq à trente ; mais il n'est pas rare d'en trouver jusqu'à soixante et même quatre-vingts. On ignore le nombre d'œufs que peut produire chaque femelle ; mais on s'accorde à penser que ces énormes nichées sont dues à plusieurs femelles appartenant au même mâle, qui viennent pondre dans le même trou.¹ Ces œufs, d'un blanc jaunâtre, à surface lisse et polie, à coquille très dure, sont allongés, d'une jolie forme, et presque de la grosseur de la tête d'un enfant. Quoique moins délicats que les œufs de poule, ils sont bons à manger, et offrent une grande ressource aux gens de la campagne, qui les mangent cuits sous la cendre et en omelettes. Comme ils se conservent très longtemps sans se gâter, on en fait de grandes provisions ; aussi la trouvaille d'un nid d'autruche est-elle considérée comme une bonne aubaine.

“Il n'est pas vrai, comme on l'a prétendu, que ces œufs éclosent sans incubation et par la seule chaleur du soleil. Le nandou couve ses œufs. L'opinion générale dans le pays est que le mâle seul se charge de ce soin ; mais je puis affirmer que, dans mes courses à travers champs, j'ai quelquefois surpris des femelles sur leur nid ou conduisant une bande de petits. Je dois dire cepen-

¹ Vide auteà, p. 60.

dant que le plus souvent c'étaient des mâles que je trouvais ainsi occupés.

Le petites autruches commencent à se montrer dans la dernière quinzaine de novembre, et l'éclosion continue jusqu'à la fin de décembre. Elles naissent couvertes d'un duvet très doux, de couleur jaunâtre avec des bandes brunes, absolument comme nos petits canards domestiques, courent à leur sortie de l'œuf, et cherchent aussitôt leur nourriture, comme les petits poulets. Lorsqu'elles sont isolées de leur bande, ou pressées par la faim, elles font entendre un petit sifflement très doux et plaintif, qu'elles répètent pendant longtemps, et auquel les autres répondent, quand elles sont à portée de l'entendre.

“La chair de ces jeunes animaux est assez bonne, quoique d'un goût très prononcé; celle des adultes, au contraire, est coriace et des plus désagréables. Les chiens n'y touchent jamais. Cependant les Indiens la mangent, mais seulement quand ils manquent de viande de jument ou d'autre gibier. Les œufs seuls, comme je l'ai déjà dit, offrent une ressource alimentaire qui n'est pas à dédaigner dans certaines occasions; chacun d'eux peut fournir un repas copieux à deux personnes.

“La nourriture des nandous se compose principalement, comme j'ai pu m'en assurer, en examinant le jabot et le gésier de plusieurs de ces oiseaux, d'insectes, surtout d'une petite espèce de sauterelle qui fourmille dans les plaines herbues des bords de la Plata, de vers, de mollusques terrestres, d'herbes de diverses sortes, principalement de graminées, de graines, et parfois de petits animaux, tels que des lézards, des petits serpents et même des petits rongeurs. Cet animal paraît très peu délicat sur le choix de ses aliments, et il avale

presque tout ce qu'il rencontre devant lui. J'ai trouvé dans son estomac, des morceaux de bois et de cuir tanné, des cailloux du volume d'une grosse noix, des boutons de métal, des fragments de boucles de fer et de cuivre, des bouts de corne, et une fois un morceau de fer provenant d'un mors de cheval, de la grosseur du petit doigt et de 8 à 10 centimètres de longueur. Cependant, quelque vorace qu'il soit, on ne le voit jamais manger la chair des grands animaux qui meurent dans les champs; jamais il n'approche de ces charognes qui font les délices des Urubus et des Caracaras.

“Les jeunes autruches, qu'il est très facile de se procurer vivantes en les poursuivant à cheval et en jetant sur elles un *poncho*, sorte de manteau du pays, s'approprient avec la plus grande facilité, et deviennent familières dans l'espace de deux ou trois jours. Mais il faut avoir soin de ne pas les enfermer dans une cage; il faut les laisser libres, avec la précaution seulement, pendant les premiers jours, de leur mettre des entraves légères aux pattes, pour les empêcher de courir, mais non de marcher. On les nourrit sans aucune difficulté avec de petits morceaux de viande fraîche, coupée dans le sens de la longueur des fibres, qu'on jette devant elles, ou qu'elles viennent prendre dans la main. Au bout de quelques jours, on peut les laisser entièrement libres. Elles se promènent autour de l'habitation, entrent hardiment dans toutes les pièces, regardent avec curiosité ce qui s'y passe, et s'occupent, presque sans discontinuer, à attraper des mouches, dont elles sont très friandes: ce qu'elles font avec une adresse et une agilité extraordinaires. A mesure qu'elles grandissent, elles s'éloignent davantage de la maison, et vont ainsi paissant jusqu'à plus d'une demi-lieue; mais elles ne

manquent jamais de revenir au logis à l'heure où l'on a l'habitude de leur donner à manger dans la journée, ou le soir, vers le coucher du soleil, pour dormir dans l'endroit qu'elles ont adopté. Lorsqu'elles ont toutes leurs plumes, toute espèce de nourriture leur convient, et elles avalent indistinctement tout ce qu'on leur jette, quelle qu'en soit la nature ; cependant elles paraissent préférer la viande crue, le maïs, le pain, le sucre, et suivent les personnes, comme un chien, pour en obtenir.

“ Pendant mon séjour au Pichinango (c'est le nom d'une vaste et magnifique propriété que je possédais, avec quelques amis, dans l'intérieur de la république de l'Uruguay, et où nous nous livrions au métissage des moutons du pays avec les mérinos de Naz (propriété dont, soit dit en passant, nous avons été dépouillés par la guerre), j'ai souvent élevé de jeunes nandous ; je n'ai pu parvenir à compléter cette éducation, à cause des chiens, qui les étranglaient toujours lorsqu'ils les rencontraient à quelque distance de la maison. J'avais cependant résolu d'en élever une bande d'une douzaine, uniquement pour mon amusement, et je ne doute pas qu'en prenant les précautions nécessaires contre les chiens, je ne fusse parvenu à les rendre aussi domestiques que les oiseaux de basse-cour, avec lesquels, d'ailleurs, ils s'accordent parfaitement bien. Mais les événements de la guerre nous ont contraints, moi et mes amis, de céder à la force brutale et d'abandonner l'établissement.

“ D'après les faits que je viens de rapporter et sur l'exactitude desquels il est permis de compter, on peut conclure :

“ 1° Que l'autruche d'Amérique pourrait vivre sans difficulté même dans le nord de la France, puisqu'elle

est commune encore en Patagonie, climat plus rigoureux que le nôtre ;

“ 2° Qu'elle ne présente absolument aucune difficulté pour l'appriivoiser, en raison de son caractère doux et pacifique ;

“ 3° Qu'elle s'accommode de toute espèce de nourriture, même la plus grossière, et qu'elle est d'une constitution très robuste, qui la rend peu sensible aux vicissitudes atmosphériques ;

“ 4° Enfin, qu'elle ne demanderait presque aucun soin ; mais qu'il lui faudrait de l'espace et de la liberté, dont d'ailleurs elle n'abuserait pas : car une fois accoutumée dans une localité, elle rentrerait toujours d'elle-même à son gîte habituel.

“ Les avantages qu'on pourrait retirer de la domestication de cet oiseau consisteraient dans les plumes, dont l'industrie fait une grande consommation, et dont le prix se maintient toujours assez élevé, et dans ses œufs, si gros et si nombreux, qui pourraient devenir une ressource alimentaire d'une certaine importance pour les gens de la campagne.”

In England, recent experiments have shown that the bird will not only live and thrive in our variable climate, but will even breed here while in a state of semi-confinement.

Mr. Walter Trevelyan of Shepton Mallet, Somersetshire, thus describes the result of an experiment made by him with three rheas, a male and two females, which had been imported from the River Plate.¹

“ They were brought home in July 1875 ; probably hatched in January that year, or December 1874, and when they arrived were about three-parts grown. They

¹ “ Land and Water,” July 29, 1876.

were at once put into a field of nine acres, where they have since remained. The field adjoins a farmyard, and during the autumn and winter they were usually driven, or rather enticed, into the yard, and, if possible, into a shed. We could not always get them in, and have several times been obliged to leave them out in heavy snow. By February they were always left out at night. One of the birds being larger and darker round the neck than the others, we set him down for a cock, a surmise which proved correct, as about the end of March or beginning of April he became rather savage, running at us with open mouth, and continually uttering his note of defiance (bōō-ōō-ōō-ō, a long way down his throat, with his mouth shut), a very deep note, but one that can be heard a long distance. In the second week of May he was seen to pair, and wandered about evidently in search of a place to make a nest. On 15th May the first egg was laid in a slight hollow, which he had enlarged and deepened by scraping. On the 16th and 17th he was restless, and made a nest in a different part of the field. We drove him out of the new nest and filled it up with sticks and stones. On the 18th an egg was laid in the open; this we carefully removed without touching it (we afterwards found that he cared as little as a barn-door fowl for his eggs being touched), and placed it by the first in the nest. This was the only egg laid out of the nest until one to be mentioned presently. We put posts and a single rail round the nest to keep off the cows. On the 25th of May eight eggs were laid, and the cock began to sit. He was very uncertain about feeding; the first time was usually about 8 A.M. Some days he would come off the nest four or five times, sometimes only once; sometimes

he did not come to be fed, but ran round the field to stretch his legs. On the 5th of June there were eighteen eggs, and on this day I saw him pair with one of the hens. This was the only time he was observed to do so after they began laying. On the 14th June there were twenty-three eggs, and on this morning one of the hens was tossed by a cow, and so injured that we killed her; she then had a dozen eggs inside her. The birds were so tame they would peck flies off the cows and ponies. I have seen one peck a hair out of the end of a cow's tail and swallow it! I forgot to say that before pairing the cock ran the cattle, so we were obliged to take the milk-cow away for a few days till he was quieter. The twenty-seventh and twenty-eighth eggs were laid on the 3d and 4th July; these I took away. On the 6th July a young bird and part of a shell were found about fifteen yards from the nest, and the hen was seen pecking at them. The hen was then shut up in the yard, and there, on the 7th July, she laid the twenty-ninth and last egg.

"On Sunday morning, the forty-sixth day from the cock commencing to sit, all was excitement, for the cock behaved in an unusual way; he left the nest on the wrong side (he usually came towards the house, where he was fed), and went back again after walking round the nest for a few minutes three times; the fourth time, 10 A.M., he marched off as proud as a peacock, with four young ones following at his heels. We went to see the nest; we did not move the eggs, but as far as we could see none appeared to be cracked. The cock did not go back to the nest. At twelve o'clock the gardener was standing by the nest looking over the rails, when two more came out, bursting the shells with a crack.

One of these the cock received with open arms, running to meet him; the other was very weak, and he was taken into the fire till the afternoon, when he too was given back to the cock (he has a contracted foot, and walks upon his knuckles). When we found the cock had entirely deserted the nest, five eggs were placed under three hens—one, two, two. In the evening the gardener again went to the nest, took up one of the eggs and broke a piece out, he saw no sign of life, and left it. On Monday morning at 11 A.M., I went to look at the nest, saw this egg broken, and knelt down to look at it. I saw that it breathed regularly but weakly. The sun was then hot, so I left it where it was, and at 1 P.M. the breathing was much stronger. At 5 P.M. I went to look at it again, and found it weaker, so put it in an oven, where it soon began to make the cry of a young bird, and finding it unable to break the shell, I let it out at 7 P.M., thirty-three hours after the cock had left the nest. It was very weak, but was kept by the fire and lived till yesterday, July 19th. I mention this to show the extraordinary vitality of a rhea's egg. I have taken away all the eggs and blown as many as I could; a few were addled, the rest had birds in all stages in them. On Monday, July 17, the hen that had one egg under her hatched it. This morning, July 20, another was hatched. These birds were at once given to the cock, so he now has eight young ones running with him. We may hatch more, as there are still three eggs under hens. If I ever have the luck to get the old cock to sit again, I shall know how to hatch most of the eggs when he has left. I have not let the hen loose, as I have not had time to watch her myself. They will not be moved at present. I think when they are moved they can be driven up an

incline into a *very low* spring luggage-cart that has a hood to it."

Nor is this an isolated instance of the reproduction of the rhea in this country. A gentleman at Chippenham, in the adjoining county of Wilts, turned out a pair of these birds into his park, and during the past summer (1876) succeeded in rearing seven young ones. Writing to announce his success, he says:¹—

"Seventeen eggs were laid altogether; twelve were left in the nest, and five removed and put under common fowls. The male bird sat for forty days exactly, and now takes sole charge of the young ones. His call is peculiar, a snapping of the bill, to which the young ones reply by a low and plaintive whine, something like that of a small puppy. Though so young, they can now (July 1876) run as fast as an old cock pheasant. The hen-bird does not seem pleased with her new family, and we were obliged to exclude her by passing her through the hurdles, and she now has betaken herself to the other end of the park, but pays occasional visits to her mate. The same pair have laid eleven, ten, and twenty eggs in each of the last three years, but until this year the male never offered to incubate." This gentleman concludes his observations with the remark that "no bird seems hardier or better able to stand the wet and cold of our winters, and no bird can be more ornamental or harmless when at liberty."

He says nothing of its utility for food, but to judge from its herbivorous propensity, and from the accounts of the writers whom we have quoted, there seems to be no reason why a young rhea, if properly fed and cared

¹ "The Field," 22d July 1876.

for, should not prove as good eating as a young turkey. The same remark applies, as will be seen later, to the Australian emus and the cassowaries.

In France, M. Quatrefages goes so far as to say¹—
“ Il faut que des bandes de Nandous (Rhea) et de Cassours s'ébattent dans nos basses-cours. Alors, mais seulement alors, la Société d'Acclimatation pourra se dire satisfaite ” !

But he qualifies this remark by adding truly—“ Pour en arriver là, la persévérance et le temps sont des éléments nécessaires.”

¹ Bull. Soc. Imp. Acclim. 1859, p. 74. See also Martin de Moussy, “ Sur la Domestication de Nandou, ou Autruche d'Amerique.” Op. cit. 1860, pp. 182-186.

CHAPTER III.

DARWIN'S RHEA—Rhea darwini, GOULD.

Described by Mr. Gould from a specimen obtained by Mr. Darwin in Patagonia—Its distinguishing characters—Difference in the egg—Mr. Darwin's account of it—Its distribution, so far as ascertained—Its habits and mode of nesting—Dr. Cunningham's experience—Mode of hunting by the Patagonians.

THIS bird, as already remarked, was first scientifically described by Mr. Gould in the "Proceedings" of the Zoological Society for 1837, from a specimen procured by Mr. Darwin at Port Desire, on the east coast of Patagonia.

It differs from the commoner species in its smaller size and shorter legs, which are feathered to the tarsus, and in having the plumage mottled, or less uniform in colour. Mr. Darwin, in his most entertaining narrative of his voyage round the world in H.M.S. "Beagle," thus describes its appearance and habits, so far as he had the opportunity of ascertaining them :¹—

"When at the Rio Negro, in Northern Patagonia, I repeatedly heard the Gauchos talking of a very rare bird which they called *Avestruz petise*. They described it as being less than the common rhea (which is there abundant), but with a very close general resemblance. They said its colour was dark and mottled, and that its legs

¹ "A Naturalist's Voyage Round the World," pp. 92-94.

were shorter, and feathered lower down than those of the common rhea. It is more easily caught by the 'bolas' than any other species. The few inhabitants who had seen both kinds affirmed that they could distinguish them apart from a long distance. The eggs of the small species appeared, however, more generally known; and it was remarked, with surprise, that they were very little less than those of the rhea, but of a slightly different



Darwin's Rhea.

form, and with a tinge of pale blue.¹ This species occurs most rarely on the plains bordering the Rio Negro, but about a degree and a half further south they are tolerably abundant. When at Port Desire, in Patagonia (lat. 48°), Mr. Martens shot an ostrich; and I looked at it, forgetting at the moment, in the most unaccountable manner,

¹ The eggs of the common rhea when first laid are creamy yellowish white, but ultimately get quite white from exposure. In regard to the texture of the shell, they closely resemble those of the ostrich, but are elliptical in shape instead of spherical.

the whole subject of the *Petise*, and thought it was a not full-grown bird of the common sort. It was cooked and eaten before my memory returned. Fortunately, the head, neck, legs, wings, many of the larger feathers, and a large part of the skin, had been preserved; and from these a very nearly perfect specimen has been put together, and is now exhibited in the museum of the Zoological Society. Mr. Gould, in describing this new species, has done me the honour of calling it after my name.

“Among the Patagonian Indians in the Strait of Magellan, we found a half-Indian, who had lived some years with the tribe, but had been born in the northern provinces. I asked him if he had ever heard of the *Avestruz petise*? He answered by saying, ‘Why, there are none others in these Southern countries.’ He informed me that the number of eggs in the nest of the *Petise* is considerably less than in that of the other kind, namely, not more than fifteen on an average; but he asserted that more than one female deposited them. At Santa Cruz we saw several of these birds. They were excessively wary: I think they could see a person approaching when too far off to be distinguished themselves. In ascending the river, few were seen; but in our quiet and rapid descent, many, in pairs and by fours or fives, were observed. It was remarked that this bird did not expand its wings when first starting at full speed, after the manner of the Northern kind. In conclusion, I may observe, that the *Rhea americana* inhabits the country of La Plata as far as a little south of the Rio Negro in 41 lat., and that the *Rhea darwini* takes its place in Southern Patagonia, the part about the Rio Negro being neutral territory. M. D’Orbigny, when at the Rio Negro, made great exertions to procure this bird, but

never had the good fortune to succeed.¹ Dobrizhoffer long ago was aware of there being two kinds of ostriches. He says,² "You must know, moreover, that emus differ in size and habits in different tracts of land; for those that inhabit the plains of Buenos Ayres and Tucuman are larger, and have black, white, and grey feathers; those near to the Strait of Magellan are smaller and more beautiful, for their white feathers are tipped with black at the extremity, and their black ones in like manner terminate in white."

Dr. Cunningham states,³ that although on several occasions he had an opportunity of examining specimens of rheas which had been killed, he never met with one of the *Rhea darwini* in Patagonia, although he frequently picked up its feathers on the plains.

Commander Chaworth Musters, R.N., who spent a year amongst the Tehuelches in the interior of Patagonia, and adopted the nomad habits with the costume and manners of the tribe, thus describes their mode of hunting this bird and the guanaco.⁴

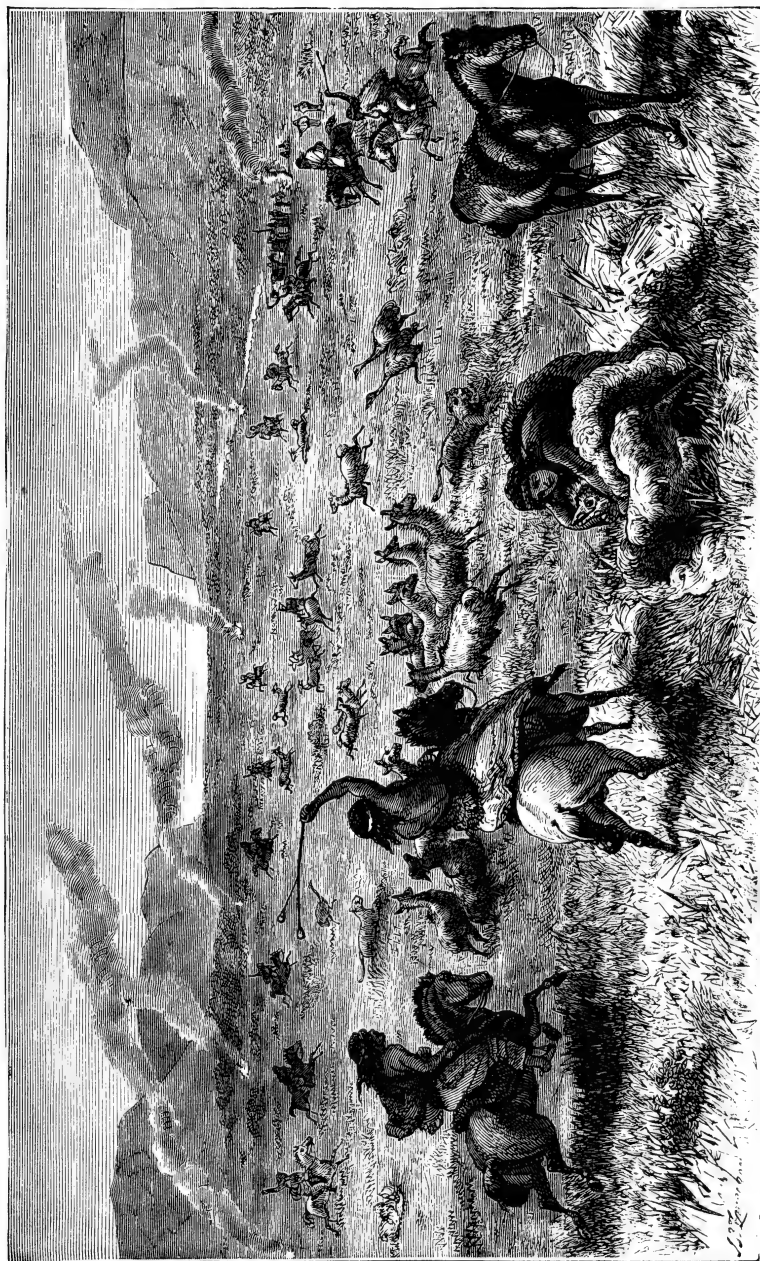
"Two men start off, and ride at a gallop round a certain area of country, lighting fires at intervals to mark their track. After the lapse of a few minutes, two others are despatched, and so on, until only a few are left with the Cacique. These spread themselves out in

¹ When at the Rio Negro, Mr. Darwin heard much of the indefatigable labours of this naturalist, who during the years 1825 to 1833, traversed considerable portions of South America, and made large collections, the result of which has since been published on a scale of magnificence which, as Mr. Darwin observes, at once places him in the list of American travellers second only to Humboldt.

² "Account of the Abipones," 1749 (English translation), vol. i. p. 314.

³ "Natural History of the Strait of Magellan," p. 134.

⁴ "At Home with the Patagonians," p. 76.



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a crescent, closing in and narrowing the circle on a point where those first started have by this time arrived. The crescent rests upon a base-line formed by the slowly proceeding line of women, children, and baggage-horses. The ostriches and herds of guanaco run from the advancing party, but are checked by the pointsmen, and when the circle is well closed in, are attacked with the bolas, two men frequently chasing the same animal from different sides. The dogs also assist in the chase; but the Indians are so expert with the bolas, that unless their horses are tired, or they happen to have gambled away their bolas, the dogs are not much called into use. Puma are frequently found in the circles, and quickly despatched by a blow on the head from a ball. The Indian law of division of the game prevents all disputes. The meat of the ostrich is highly prized, especially if the giant bird be in good condition. Owing to the entire absence of farinaceous food, the Tehuelches devour a great quantity of fat, as indeed every one must do in uncivilised countries. After the hunt, a great feast is held; a portion of the meat is reserved for the women and children, then a pipe is handed round, saddles are readjusted, and the party adjourn to the toldos, which by this time have been pitched and arranged by the women. Unless ostriches are very scarce, or the Indians have a peculiarly strong longing for blood, they do not kill the guanaco, but its flesh is excellent.¹ The

¹ This singular ruminant ranges over a vast tract of country extending from Peru all down the regions east of the range of the Cordillera of the Andes, over the vast plains from Mendoza to the Strait of Magellan, and even to Tierra del Fuego; and is to the South American Indian what the reindeer is to the Laplander—a most useful animal in many respects. The skin of the adult is used to make the coverings of the toldos, and that of the young

meat of the haunches is generally cut off in thin slices, lightly salted, and dried in the sun. When thoroughly dried, it is roasted in the ashes, pounded between two stones, and mixed with ostrich or other grease; this preparation, like pemmican, is very useful for a man going a long journey, as it can be carried in a small compass, and a mere handful satisfies the appetite."

The party to which Mr. Musters had attached himself made their way slowly up the valley of the Rio Chico, which was still frozen over. They journeyed and hunted in the teeth of a piercing wind, and with occasional showers of snow. The valley sometimes opened out into wide grass-covered plains, dotted with incense-bushes, then rose again in huge bare ridge-and-furrow-like undulations. Occasionally there occurred patches of swampy ground with frozen lagunes, and here and there open springs, the resort of numerous waterfowl. Bare and rugged hills rose abruptly out of the plains; and frequently a high hill of basalt, assuming the appearance of a ruined castle, closed in the bends of the winding river.

"A grander sight," says Mr. Musters, "can hardly be presented by the animal world than the flight of a great herd of ostriches, as they race with inconceivable speed, with their strong feet spurning the earth and the sand, and their brilliant watchful eyes shaded with eyelashes like slanting rain. The Patagonian rhea, or ostrich, is smaller and of lighter colour than the American. These

ones to make mantles for clothes; the sinews of the back furnish thread; the skin of the neck furnishes lazos or thongs for bolas and bridles; the skin of the hough supplies them with shoes or coverings for the bolas from the thigh-bone they cut out dice, or make a musical instrument.

birds are very swift of foot, and run with their wings closed, while the other species invariably spread theirs.¹ The wing-feathers are sold for a dollar a pound at Buenos Ayres. The neck is used as a pouch for salt or tobacco; from the sinews of the leg thongs for bolas are constructed; the grease from the breast and back is secured in bags formed of the skin; the meat is more nourishing than that of any other animal in the country; and the eggs form a staple commodity of food during the months of September, October, and November. The male bird is swifter than the female. When any danger appears, they will feign to be hurt, in order to attract the attention of the hunter from their brood. Their usual food consists of short grass and the seeds of various shrubs. They possess great power of sight. If met or obstructed by horsemen in their line of flight, they not unfrequently squat so closely that they can scarcely be distinguished from the surrounding rocks, as the greyish colour of their plumage so closely resembles the almost universal aspect of the Pampas of Patagonia. Although not webfooted, they can swim sufficiently well to pass a river.² In the winter season, the Indians frequently drive them into the water, where, their legs getting numbed with cold, they are drifted to the shore by the current, and easily captured. In snowy weather they are also readily taken, as their eyes appear to be affected by the glare of the white snow, and their saturated plumage becomes heavier. Contrary to the usual rule among birds, the male sits on the eggs, and when

¹ This is singular, but confirms the account given by Mr. Darwin. Vide *supra*, p. 87.

² This confirms Mr. Darwin's observation with regard to the common rhea. See p. 58.

the chickens are hatched, assumes the charge of the brood."

The eggs, of which we have seen specimens in the possession of Mr. A. D. Bartlett, are of a creamy white colour, but with the surface of the shell more pitted than in the case of *R. americana*, and as regards shape, more pointed at both ends.

It may be worth noting here that in the Zoological Society's Gardens in 1862, the young male rhea upon which Mr. Selater founded his species *macrorhyncha*, paired with a female *Rhea americana*; the male bird making the nest, arranging the eggs, and performing the whole duties of incubation.¹ Two young ones were reared. In 1863 the male bird commenced to sit on the 8th May, at which time there were only two eggs in the nest. The female, however, continued to lay, and deposited altogether twelve eggs.²

The eggs of the rhea hatched in the incubator required thirty-five days to hatch, which is somewhat less than the time usually occupied when hatched in the natural way.

¹ This is not always the case with wild birds. See p. 75.

² See Selater, Proc. Zool. Soc. 1863, p. 234.

Dr. Selater. Trans. Zool. Soc. read Apr. 24 & May 8. 1860.
Judging from the specimen of *Rhea Darwinii* now living
in the gardens, instead of being smaller than the
common species as is usually supposed to be the
case, seems to be the largest & finest of the group
and certainly the most ostrich-like in its
characters of the three. - I cannot therefore help
thinking that the "*Arctostyrax petiti*" which W. Darwin
alludes to in his journal may possibly be the
Rhea macrorhyncha and not the *Rhea darwinii*
as he has been inclined to suppose —

CHAPTER IV.

THE LONG-BILLED RHEA—*Rhea macrorhyncha*, SCLATER.

Its distinguishing characters as pointed out by Mr. Sclater—Possibly only a variety of *Rhea americana*—Its habitat at present undetermined.

IN November 1858, a young rhea was purchased in Liverpool for the Zoological Society of London, which, on arriving at maturity, seemed to possess certain characters which, on comparison, were not observable either in the common, or Darwin's rhea; and in the "Proceedings" of the Society for 1860 (p. 207), the secretary, Mr. Sclater, described it under the above title as a new species.



The Long-Billed Rhea.

He says (l. c.) :—"The long-billed rhea (*Rhea macrorhyncha*, as I propose to call it) is a much smaller

bird than the common rhea. The example in the gardens, a male, stands about six inches lower than the two females of the American rhea, which are in its company, and we may reasonably suppose that the female is proportionally smaller. The bill is much larger than that of the common rhea, and the head-feathers are larger and more closely flattened down. On the other hand, the tarsi are much more slender, and the toes much shorter. The thighs are less thickly clothed than in the common rhea ; but the scutellation of the tarsi seems to be nearly the same in both these birds, and offers a marked contrast to that of *Rhea darwini*, in which the tarsi are for the greater part covered with reticulated scales.

“The feathers of the body are longer in the long-billed rhea, and curve round it, hiding the outline in a manner not observable in the common rhea.

“With regard to colouring, the new species is also very different, being of a brownish-grey mixed with black, and altogether much darker than *Rhea americana*. The top of the head and streak at the back of the neck in particular are of a deep black.” The bird has since died.

We confess that we have some slight misgiving as to the specific distinctness of this bird, and are inclined to think that, as no further specimens have been procured, it may after all prove to be merely an individual variety of *Rhea americana*. Ornithologists must have observed that the bills of young birds are often developed much sooner than any other part of their anatomy, and hence, for a time, appear much larger in proportion to the size of the birds than do those of the parents. Should we be mistaken, however, in supposing that *Rhea macrorhyncha* is not a valid species, its haunts and habits remain to be ascertained.

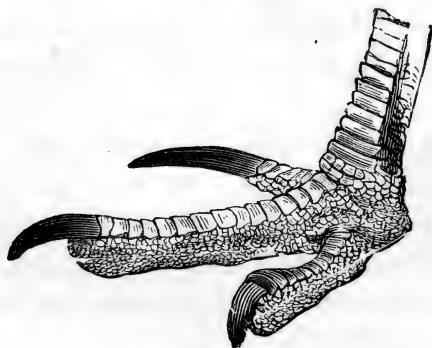
CHAPTER V.

THE AUSTRALIAN CASSOWARY—

Casuarius australis, WALL.

The cassowaries—The respects in which they differ from the true ostriches—Their peculiarities of structure—Three groups: those with two wattles, one wattle, and no wattle—Table of species—The Australian cassowary (*Casuarius australis*)—Its recent discovery—Description—Haunts, and difficulty in procuring specimens—Habits, so far as known, and nature of its food.

It will be seen on glancing at the table given on page 6 that the cassowaries, although possessing three toes like the rheas, differ remarkably from these birds and from the ostrich, in having the head bare, and surmounted



Left Foot of Cassowary.

with an elevated horny casque or helmet. The skin of the neck is also bare, and generally very brightly coloured, while the nail of the inner toe is remarkably lengthened and powerful. Four out of the nine known species have

two pendant neck-wattles; a fifth is characterised by possessing a single wattle, and the remaining four are destitute of any such appendage.

The distinguishing characters of these nine species have been very clearly pointed out in the "Proceedings" of the Zoological Society for 1875¹ by Mr. Selater, who thus discriminates them:—

Genus—CASUARIUS.

- a. Casque compressed *laterally*; neck-wattles, *two* or double.
 1. *C. australis*, Wall; North Australia.
 2. *C. galeatus*, Vieillot; Ceram.
 3. *C. beccarii*, Selater; Wokan, Aru Is.
 4. *C. bicarunculatus*, Selater; Aru Is.
- b. Casque compressed *vertically*; neck-wattle, *one*.
 5. *C. uniappendiculatus*, Blyth; Isle of Salwatti, and opposite coast of New Guinea.
- c. Casque compressed *vertically*; neck-wattles, *none*.
 6. *C. papuanus*, Rosenberg; Northern New Guinea.
 7. *C. westermanni*, Selater; Isle of Jobi, off New Guinea.
 8. *C. picticollis*, Selater; Southern New Guinea.
 9. *C. bennetti*, Gould; New Britain.

Of the above-mentioned species, numbers 1, 2, 3, 5, 8, and 9 are now living in the gardens of the Zoological Society of London, and numbers 2 and 9 have bred there.

A cassowary of some species is stated to exist in the Solomon Islands (*cf.* Hutton, "Ibis." 1869, p. 352), and if this be so, it is probably a species distinct from any of the above-named; but the only specimen alleged to have been thence received has proved on examination to be *Casuaris bennetti*.

The existence of a cassowary in Australia was first made known in 1854 by the late Mr. Thomas Wall, who, like many other explorers of that vast continent, perished

¹ See also "Nature," vol. xii. p. 516.

for want of food in its inhospitable wilds whilst in pursuit of scientific knowledge. The specimen first described by him was shot near Cape York, where, in the deep gullies, well-nigh inaccessible, at the base of high hills, the species was found running in parties of seven or eight. This specimen unfortunately was lost at Weymouth Bay, as we learn from Mr. Carron,¹ one of the survivors of Kennedy's ill-fated expedition, to which Mr. Thomas Wall was the accredited naturalist. The following description, however, by Mr. Wall, was published by his brother, Mr. William Sheridan Wall (at that time Curator of the Australian Museum at Sydney), in the "*Illustrated Sydney Herald*" of June 3, 1854:²—

"This cassowary, when erect, stands about five feet high; the head is without feathers, but covered with a blue skin, and, like the emu, is almost without wings, having mere rudiments; the body is thickly covered with dark-brown wiry feathers; on the head is a large prominence or helmet of a bright red colour,³ and to the neck are attached, like bells, six or eight round fleshy balls of bright blue and scarlet, which give the bird a very beautiful appearance.

"The first, and indeed the only, specimen obtained of the Australian cassowary was unfortunately left at Wey-

¹ Proc. Zool. Soc., 1867, p. 474.

² This account was reprinted, Proc. Zool. Soc., 1857, pp. 270, 271.

³ There seems to be some error here in regard to the colour of the helmet which is horn-colour, as well as in regard to the colour of the neck-wattles, which are blue. See Krefft, "*Ibis*," 1869, pp. 348, 349.

It should be observed that Mr. W. S. Wall had no specimen before him to describe, but took his description secondhand from Mr. Carron, who returned from the expedition after the specimen had been lost, and whose memory as regards the precise distribution of the colours about the head and neck of the bird may well have failed him.

mouth Bay, and has not been recovered. Mr. Wall, being most anxious for its preservation, had secured it in a canvas bag, and carried it with him to the spot where, unfortunately for science, it was lost. In the ravine where the bird was killed, as well as other deep and stony valleys of that neighbourhood, it was seen running in companies of seven or eight. On that part of the north-eastern coast, therefore, it is probably plentiful, and will be met with in all the deep gullies at the base of high hills. The flesh was eaten and found to be delicious; a single leg afforded more substantial food than ten or twelve hungry men could dispose of at a single meal. The bird possesses great strength in its legs, and makes use of it in the same manner as the emu. Its whole build is more strong and heavy than the latter bird. It is very wary, but its presence may be easily detected by its utterance of a peculiarly loud note, which is taken up and echoed along the gullies; and it could be easily killed with a rifle."

Twelve years later, namely, in 1866, Mr. W. J. Scott, who had an extensive sheep-run in the Valley of Lagoons, on the Upper Burdakin river, about one hundred miles west from Rockingham Bay, communicated to the Zoological Society of London the fact that in the last-named locality the bird was well known to the natives as the black emu, but that it was exceedingly difficult to obtain. Mr. Scott himself had never met with one, but he forwarded a bundle of feathers belonging to a bird of this species which had been taken out of a native hut in the neighbourhood.¹

In the autumn of the same year, 1866, Mr. G. R.

¹ Proc. Zool. Soc., 1866, p. 557.

Johnson, while on a visit to Rockingham Bay, shot a cassowary in the Gowrie Creek Scrub, which he preserved and presented to the museum at Sydney.¹ This was subsequently identified with Wall's species by Mr. W. Carron (*cf.* P. Z. S., 1867, pp. 473, 474), one of the survivors of his ill-fated expedition. Ultimately, Mr. Ramsay reported (P. Z. S., 1868, p. 388) that cassowaries had been seen in the neighbourhood of Rockingham Bay, and through the exertions of Mr. Charles Scott of Queensland, brother to Mr. W. J. Scott above-mentioned, a very fine and perfect skin of *C. australis* was forwarded in 1868 to the Zoological Society, from which Mr. Gould prepared his beautiful coloured plate in the Supplement to his "Birds of Australia," and the acquisition of this specimen enabled Mr. Sclater at once to set at rest all doubts which might have existed as to the distinctness of this species from the cassowary of Ceram, *C. galeatus*.

The distinguishing features of these two species, as pointed out by him,² are as follows:—

The crest of the Australian bird is of a different shape from that of *C. galeatus*, rising much more erect from the head, and attaining a much greater development than in even the largest examples of the latter species. In *C. australis*, also, the crest is extremely compressed towards the edges, terminating in two thin laminæ of horn united in a medial line. The tarsi are thicker and

¹ This was the bird subsequently described as *Casuarus johnsoni* by Dr Mueller (Proc. Zool. Soc., 1867, p. 242) and Mr. Gerard Krefft (Proc. Zool. Soc., 1867, p. 482), and figured and described again by Mr. Diggles under the name *Casuarus johnsonii* (Krefft) in his "Ornithology of Australia." See also Krefft, "Ibis," 1869, pp. 348, 349, and A. Newton, "Ibis," 1870, p. 120.

² Proc. Zool. Soc., 1868, p. 376.

stouter, and the elongated claw on the inner toe of *australis* is straight and much more developed. The wing in *australis* is composed of four or five strong barbless quills, and terminated, as in other species of the genus, by a well-developed claw. The gular caruncle appears rather to resemble that of *galeatus*, being divided nearly down to its base, and terminating in two red flaps; but the colour of the naked throat and fore-neck is a fine cobalt blue, instead of dull purple as in *C. galeatus*.

From an account furnished by Dr. Mueller of Melbourne,¹ it appears that the Australian cassowary keeps almost entirely to the more open parts of the scrub, and seldom ventures far out on the plains. During the months of July, August, and September, its food consists chiefly of an egg-shaped, blue-skinned berry. This, together with herbage, probably forms its chief diet, at least for that portion of the year; but at present its habits have been so little observed, that hardly anything is known concerning them. In the stomach of a specimen shot by Mr. G. H. Davidson of Rockingham Bay was a fruit resembling a lemon, but with a stone inside.²

Mr. W. Carron, the only survivor of Kennedy's expedition, and who was present when Walls' specimen of the Australian cassowary was shot, says³ that this species appears to confine itself to the gullies in the thick jungles with the brush turkeys and jungle-fowl, feeding on the various fruits found there, even swallowing the large seeds of *Castanospermum* and *Pandanus*.

An account of the osteology of this species by Prof.

¹ Proc. Zool. Soc., 1867, pp. 241, 242.

² Diggles' "Ornithology of Australia," parts xii., xiii., art. *Cassuarius johnsonii* (Krefft).

³ Proc. Zool. Soc., 1867, pp. 473, 474.

Flower will be found in the "Proceedings" of the Zoological Society for 1871, p. 32, based on the skeleton of a fine adult bird forwarded by Mr. Scott from Queensland.



Skull of Australian Cassowary; half the natural size.¹

Three adult specimens of *C. galeatus* with which Professor Flower compared it were found to vary considerably in size *inter se*, but from the table of dimensions which he gives, it appears that the largest specimen of *C. galeatus* is considerably exceeded in every dimension

¹ From the "Proceedings" of the Zoological Society, 1871, p. 33, by permission.

by the specimen of *C. australis*, so that Mr. Sclater's statement that the latter species attains to a larger size is confirmed. Professor Flower, however, considers that it is not safe to lay too much stress on slight differences in the shape of the horny casque, as it varies not only with age, but also considerably in the three (all perfectly adult) examples of *C. galeatus* examined by him.

Although *Casuaris galeatus* has more than once bred in the gardens of our Zoological Society, the same success has not resulted with the Australian species. In Paris, however, in the Jardin des Plantes, the Australian cassowary has layed its eggs and reared its young, and it was remarked by M. Geoffroy St. Hilaire, that the male bird performed the duties of incubation.



THE CERAM CASSOWARY, *Casuarinus galeatus*.

CHAPTER VI.

THE CERAM CASSOWARY—Casuarius galeatus, VIEILLOT.¹

The oldest and best known species—The respects in which it differs from *C. australis*—Its true country until recently unknown—Vieillot's account of its habits—Mr. Wallace's experiences in Ceram.

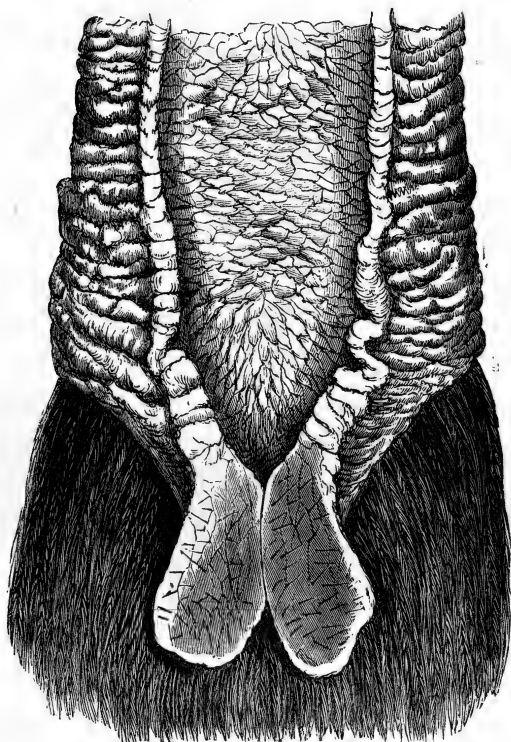
THIS, the oldest and best known of all the cassowaries, was described more than a century ago by Linnæus under the name *Struthio casuarius*, and was the only species of the genus (as now restricted) known to him. Although he seems to have confounded it to some extent with the emu (*Dromæus novæ-hollandiæ*), applying to it that name as a synonym, his mention of the bare head (*caput nudiusculum*), the helmet (*galea*), and the two neck-wattles (*palearia membranacea* 2), taken in connection with the other characters which he assigned to it, sufficiently indicate the present species.

The particular respects in which it differs from the Australian cassowary have been already alluded to,² and of these, the most striking perhaps, to a casual observer, is the different colour of the naked throat and fore-neck. Although it has frequently been stated that this bird is a native of Java, Sumatra, Banda, and the Moluccas generally, no confirmatory evidence of this is forthcoming, and the only locality that can with certainty be assigned to it is the Island of Ceram. Specimens pro-

¹ Dict. d'Hist. Nat., vol. v. p. 345 (1816); and Gal. Ois., vol. ii. p. 77, pl. 225 (1834).

² See ante, p. 99.

cured there are in the Leyden Museum (*cf.* Schlegel, Zool. Garten, 1866, p. 177); and Mr. Wallace's testimony on this point is conclusive. In the highly interesting narrative of his travels in the Malay Archipelago,¹ he says: "Another large and extraordinary bird



Neck of Ceram Cassowary.

is the cassowary, which inhabits the Island of Ceram only.² It is a stout and strong bird, standing five or

¹ "The Malay Archipelago," vol. ii. p. 149.

² It will be recollected that Mr. Wallace spent eight years in exploring the principal islands of the Malay Archipelago, and investigating their natural history, and as during that time he travelled about 14,000 miles within the Archipelago, and made sixty or seventy separate journeys, he

six feet high, and covered with long, coarse, black, hair-like feathers. The head is ornamented with a large horny casque or helmet, and the bare skin of the neck is conspicuous with bright blue and red colours. The wings are quite absent, and are replaced by a group of horny black spines, like blunt porcupine quills."

An American naturalist, Dr. J. B. Steere, who in 1875 made a tour of the Island of Celebes, has recently informed us that he failed to discover any trace of a cassowary there. On one occasion, in the streets of Macassar, he saw a specimen of *C. galeatus*, but this he ascertained had been brought from Ceram.

Although the existence of this bird has been so long known, little has been ascertained of its habits. This, no doubt, must be attributed to the remoteness of its haunts, its very restricted range, and the difficulty in obtaining reliable information concerning it. Vieillot, who published an account of it in the "Dictionnaire d'Histoire Naturelle" (vol. v. p. 345), refers particularly to the hair-like feathers with which it is covered, and which, combined with the absence of a tail, cause it, when viewed at a little distance, to look more like a beast than a bird.¹ It combines, he says, the stomach of a graminivorous animal with the intestines of a carnivorous one. It subsists on fruits and roots of plants, its diet being purely vegetable. Signor D'Albertis

could hardly have failed to meet with so large a bird as the cassowary, had it existed, as alleged, on other islands besides Ceram.

¹ It may be noted that, in addition to the peculiarities already pointed out (p. 3), the *Ratite* differ from all other birds, and resemble the mammalia in having the *pennæ* or contour feathers distributed evenly over the body, and not in definitely circumscribed patches or bands, between which the skin is either bare or covered only with down. See W. K. Parker, Encycl. Brit., 9th edit., art. "Birds," p. 727.

counted forty-three almost undigested seeds of the fruit of a *Pandanus* in the excreta of a cassowary in New Guinea.¹ It runs swiftly, but being more clumsy and heavy than an ostrich, its gait is by no means graceful. In temper it is fierce and spiteful, and uses both bill and feet dangerously in striking.

In many important points of internal structure the cassowary differs materially from the ostrich. It is, in fact, not a desert bird at all, although fleet and powerful. Its digestive organs are not adapted for hard and coarse diet, but for fruits and tender succulent herbage. It wanders, says Mr. Wallace,² about the vast mountainous forests that cover the Island of Ceram, feeding chiefly on fallen fruits and on insects or crustacea. The female lays from three to five large and beautifully shagreened green eggs upon a bed of leaves, the male and female sitting upon them alternately for about a month. Cuvier has stated, but apparently only from supposition, that this bird abandons its eggs, like the ostrich, to be hatched by the heat of the sun—a statement which is not borne out either by the observations of modern travellers or the experience of directors of Zoological Gardens.

In June 1866, and July 1867, a pair of *C. galeatus* bred in the gardens of the Zoological Society, and reared their young. This was believed to be the first instance that had occurred of the successful reproduction of this species in Europe.

¹ The "Ibis," 1876, p. 362.

² "The Malay Archipelago," vol. ii. pp. 149, 150.

CHAPTER VII.

BECCARI'S CASSOWARY—*Casuarus beccarii*, SCLATER.

Discovered by Dr. Beccari in the Aru Islands—Its distinguishing characters, as pointed out by Mr. Sclater—A living example procured during the voyage of the "Basilisk," and brought to England—Now living in the Gardens of the Zoological Society.

IN introducing this species for the first time to the notice of naturalists at a meeting of the Zoological Society of London in February 1875, Mr. Sclater exhibited coloured sketches of the bird, and also of its head and neck, taken from a stuffed specimen in the Museo Civico at Genoa, which had been procured by Dr. Beccari in Wokan, the most northern of the Aru Islands. From these it will be seen that this species is one of the two-wattled, or, more correctly speaking, double-wattled cassowaries, having a median throat-wattle, divided at its extremity into two small lobes. From the shape of the crest, which is considerably elevated, it appears to be most nearly allied to *Casuarus australis*, and has remarkably large and powerful legs.

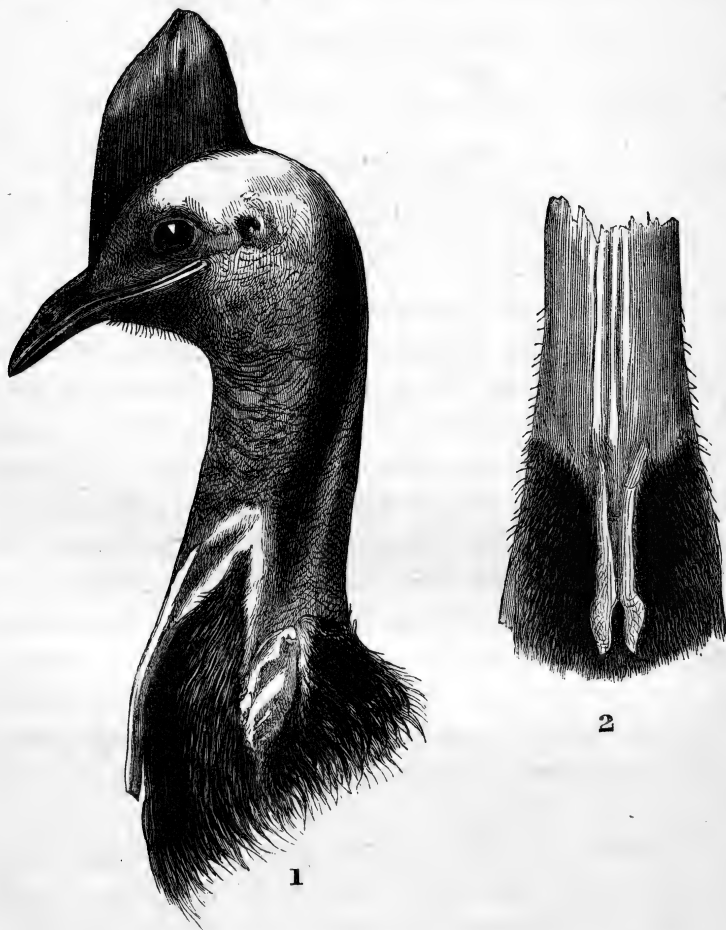
In naming it after its discoverer, Mr. Sclater thus described it—" *Similis C. australi et crista pari modo elevata: sed caruncula cervicis una media, ad apicem divisa.*"¹

The colours of the naked parts of the head and neck,

¹ Proc. Zool. Soc., 1875, p. 87, figs. 1 and 2, and tom. cit., p. 527, pl. lviii. See also "Nature," vol. xii. (1875), p. 516.

as given in a drawing from a specimen in spirits in good preservation, show that in this respect also *C. beccarii* comes nearest to *C. australis*.

In June of the same year (1875) a cassowary, brought



Head and Neck of Beccari's Cassowary.

from New Zealand by Dr. Hector, was presented to the Zoological Society by the Right Hon. Sir James Fergusson, Bart., late Governor of the colony, and was

identified by Mr. Selater as belonging to the present species.¹

This bird was obtained in 1873, when quite young, along with another similar specimen, by the officers of H.M.S. "Basilisk," from the natives of Touan, or Cornwallis Island, in Torres Straits, four miles distant from the south coast of New Guinea, and seventy miles from the opposite coast of Cape York.² The natives are said to have captured the birds on the coast of New Guinea. The specimen in question was conveyed in the "Basilisk" to Wellington in July 1873, and remained there until shipped to London. When brought to Wellington, it was supposed to have been about nine months old. It is still living in the Zoological Society's Gardens.

It is a large robust bird; the forepart of the neck blue, with the neck wattle-bilobed, as shown in the engraving, and flesh-coloured; the back of the head verdigris-blue, and the back of the neck orange. The nail on the inner toe, which in all the cassowaries is very long and strong, and in *C. picticollis* especially is extraordinarily developed, is in this species of moderate length, not exceeding two inches. This, however, must be regarded as a variable character.

Mr. A. D. Bartlett informs us, that in confinement this long nail on the inner toe, although so strong, is often liable to fracture, and that an inch or more may be broken off, and will grow again.

¹ Proc. Zool. Soc., 1875, p. 527.

² See Moresby, "Discoveries and Surveys in New Guinea," 1876, pp. 229, 230.

CHAPTER VIII.

*THE TWO-WATTLED CASSOWARY—**Casuarus bicarunculatus.*

Inhabits the Aru Islands—The respects in which it differs from its congeners—The importation of live specimens—Professor Schlegel's remarks on this species and its allies.

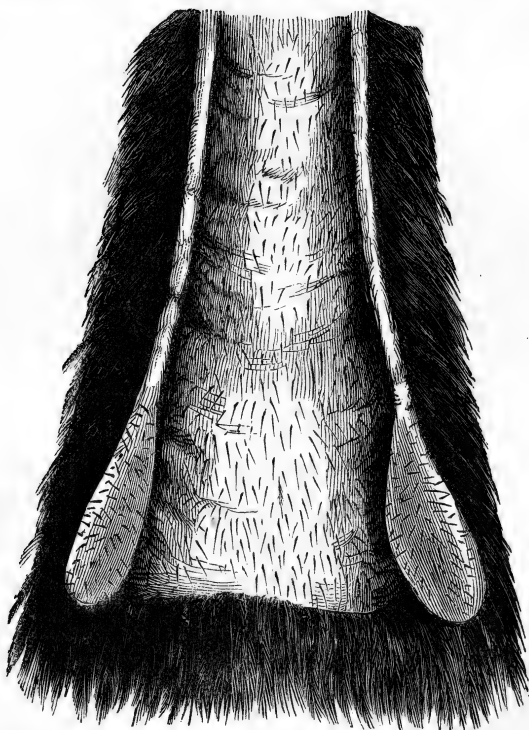
IN the "Proceedings" of the Zoological Society for 1860 (p. 211), Mr. Selater directed attention to a young cassowary which he had recently obtained for the Society's Gardens by exchange with the Zoological Society of Rotterdam, "distinguishable from the common cassowary by the throat caruncles being placed far apart on the sides of the throat, lighter colouring, &c." The specimen in question being immature, and the casque not developed, it might well have passed for a bright-coloured variety of *C. galeatus*, except for the complete separation of the neck-wattles, as shown by Mr. Selater in the woodcut illustrating his remarks.¹ Unfortunately, the bird died before arriving at maturity, as did also a second example, in the immature brown plumage, obtained from the same source in 1869.²

In 1872, however, a fine adult specimen of this species, procured in Calcutta, was transmitted to our Society, and fully established the validity of the species, as indicated by Mr. Selater, not only by reason of the

¹ Proc. Zool. Soc., 1860, p. 248. Here reproduced by permission.

² See Proc. Zool. Soc., 1869, p. 149. These specimens are preserved in the British Museum.

two lateral widely separated neck-wattles, but on account of its smaller casque, rising from a much smaller basis



Neck of Two-wattled Cassowary.

on the vertex, and the very different colouring of the head and neck; all of which features are admirably portrayed in the coloured plate furnished by Mr. Sclater in illustration of his remarks on the species.¹

Some further notes on the species by Professor Schlegel will be found in his "*Observations Zoologiques*" (Nederl. Tids. Dierk., vol. iii. p. 347). There are several stuffed specimens of this cassowary in the Leyden Museum, which were obtained in the Aru Islands.

¹ Proc. Zool. Soc., 1872, p. 495, pl. xxvi.

CHAPTER IX.

THE ONE-WATTLED CASSOWARY—

Casuarus uniappendiculatus, BLYTH.

Described by the late Mr. Blyth from a living specimen in an aviary at Calcutta—Its habitat then unknown—Additional specimens obtained, and the species found to inhabit the Island of Salwatti and opposite coast of New Guinea—Confounded with *C. papuanus* of Rosenberg and other species—An attempt to clear up the confusion.

THIS species was first described by the late Mr. Blyth,¹ who bestowed on it the specific name of *uniappendiculatus* from its peculiarity of having but a single pendulous caruncle in front of the neck.

The specimen which he described was in the aviary of the Bábu Rajendra Mullik of Calcutta, and was apparently more than half grown, and much paler in the colouring of its plumage than two specimens of the same age of the common *C. galeatus* which were confined in the same paddock with it. In lieu of the two bright red caruncles of the latter, the present species has but a single small oblong or elongate oval *yellow* caruncle, and the bright colours of the naked portion of the neck are differently disposed.

The cheeks and throat are smalt-blue, below which is

¹ Journ. As. Soc. Bengal, vol. xxix. for 1860, p. 27. See also the "Ibis," 1860, pp. 193, 306, 402, 420, pl. xiv.; 1861, p. 312; 1862, p. 78. Proc. Zool. Soc., 1860, p. 210; and Ann. Mag. Nat. Hist., 3d series, vol. vi. p. 113.

a large wrinkled space of saffron yellow in front of the neck, terminating in front in the oval button-like caruncle, and its lower portion being continued round behind, while on the sides of the neck the yellow naked portion is continued down to its base, the bordering feathers more or less covering and concealing this lateral stripe of unfeathered skin; on the hind part of the neck the bare yellow skin is not tumous and corrugated as in the common cassowary, in which species, moreover, this part is bright red. The plumage is conspicuously brown, and not black.

The casque is about equally developed at this age in the two species. The legs of *uniappendiculatus* are smaller, however, from which it may be doubted whether it ever attains so large a size as the other.

In August 1860, Dr. George Bennett, while on a visit to Amsterdam, noticed a cassowary in the Zoological Gardens there, which struck him as corresponding very nearly with the species then recently described by Mr. Blyth. Subsequent investigation proved his surmise to be correct, and he communicated the fact to the ornithological world in a letter to the "Ibis" for 1860 (p. 402), accompanying his remarks with a coloured drawing (pl. xiv.) of the head and neck of the bird then living at Amsterdam. The history of this specimen, so far as he could ascertain it, was to the effect that it was brought home by the ship "Agatha and Maria" from the Moluccas, but no particular island was named.

The locality whence Mr. Blyth's specimen came was also unknown to him, but in the "Journal für Ornithologie" for 1861 (p. 44, pl. 1 bis), Herr von Rosenberg described as new a cassowary which has since been shown to be a young bird of the same species as that

described by Mr. Blyth, and which came from the Island of Salwatti near New Guinea.¹ To this bird Von Rosenberg gave the name of *Casuarius kaupi*, in honour of a distinguished German ornithologist since deceased.²

A few years later, namely, in 1866, Professor Schlegel communicated the fact³ that the Museum at Leyden had then received seven specimens of a cassowary obtained by the well-known traveller Bernstein in the Island of Salwatti and on the opposite coast of New Guinea, in the same locality where Von Rosenberg had found his specimen of *C. kaupi*. The species had proved to be *C. uniappendiculatus*, Blyth, and identical with the living example in the Amsterdam Gardens, the single caruncle not being developed in the younger bird. In this view Mr. Gould concurred when figuring *C. uniappendiculatus* in the Supplement to his "Birds of Australia."

In September 1871, however, the Zoological Society of London obtained by exchange with the Zoological Society of Amsterdam a young cassowary, said to have been captured in the summer of 1869 by a missionary on the north coast of New Guinea, which appeared to Mr. Sclater to be "identical with the bird described by Rosenberg as *Casuarius kaupi*."

"Dr. Schlegel," says Mr. Sclater,⁴ "has referred this species to the young of *C. uniappendiculatus*; but I can

¹ See "Ibis," 1861, p. 312. This specimen is described as having no wattle. It must therefore have been an immature bird (cf. "Ibis," 1870, p. 120). From more recent observation Mr. Sclater is enabled to state ("Ibis," 1874, p. 417) that "even in its immature brown plumage, as shown by the living example now in the Zoological Society's Gardens, this cassowary has a distinct median wattle."

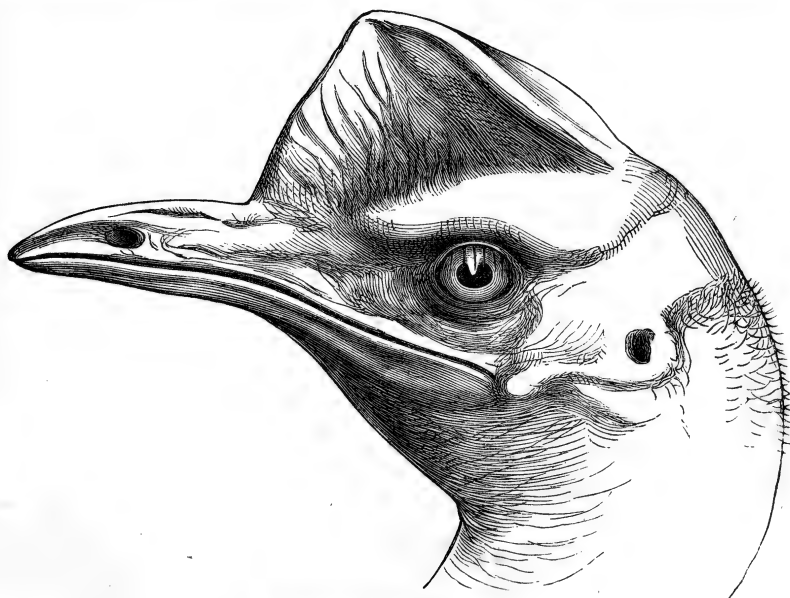
² Rosenberg (l. c.) See also Journ. für Orn., 1864, p. 134.

³ Proc. Zool. Soc., 1866, p. 168.

⁴ Proc. Zool. Soc., 1871, p. 627.

hardly believe our bird to be the same as the latter species, there being no traces at present of any throat-wattle at all, and the size being so much smaller. Our bird seems to belong to a species closely allied to *C. bennetti*, but quite distinct."

The following year 1872, Mr. Sclater, referring to the apparent confusion which existed on the subject, directed attention¹ to the fact that Von Rosenberg described his specimen of *C. kaupi* as an *old male*, and distinguished



Casuarius kaupi, SCLATER.

it from *C. galeatus* by the entire *absence* of any throat-wattles. On this ground he thought that *kaupi*, Rosenberg, could not possibly be referred to *uniappendiculatus*, Blyth, as suggested by Professor Schlegel, especially also as it was so much smaller in size than that

¹ Proc. Zool. Soc., 1872, p. 147, pl. ix.

large species, and though very nearly adult, showing no traces whatever of a gular caruncle.

After communicating with Dr. Kaup, in whose care at the Darmstadt Museum, was the original specimen of *C. kaupi*, he came to the conclusion that a second species of cassowary occurs in New Guinea, more nearly allied to *C. bennetti* than to *C. uniappendiculatus* (the only species previously known to inhabit that country), and that the specific name *kaupi* ought to be retained



Casuarus kaupi, SCLATER.

for it. He has accordingly figured it under that name (l. c. pl. ix.)

It seems, however, after all, that the bird from Northern New Guinea, which Mr. Sclater took to be *kaupi*, Rosenberg, is not that species but a different one; apparently that to which Rosenberg had given the name *papuanus*.¹

¹ Cf. Rosenberg, Journ. für Orn., 1873, p. 39 and Schlegel, Nederl. Tijds. Dierk., vol. iv. p. 54.

So that the species will stand thus:—

1. *C. uniappendiculatus*, Blyth = *C. kaupi*, Rosenberg (nec Selater).
2. *C. papuanus*, Rosenberg = *C. kaupi*, Selater (nec Rosenberg) = ? *C. westermanni*, Selater.¹

A third species from New Guinea, *C. picticollis*, Selater, has since been discovered, of which we shall have to speak later.

In August 1874, the Zoological Society received a young specimen of *C. uniappendiculatus* from Captain Moresby of H.M.S. "Basilisk," who obtained it from the Rajah of Salwatti.² This specimen is figured in the "Proceedings" of the Society for 1875, pl. xx. fig. 1. A larger and beautifully coloured figure of the species is given by Mr. Gould in the Supplement to his "Birds of Australia" (part v. pls. 74, 75), while a drawing of the head and neck, also coloured, will be found in the "Ibis" for 1860, pl. xiv.

The egg has been described by Mr. Selater³ from three specimens laid in the Zoological Gardens at Amsterdam. One of these, which we have seen, is in the possession of Mr. A. D. Bartlett, and is of the usual form and size of eggs of the genus *Casuarinus*, but of a pale greenish white, thickly studded over with raised spots of a bright dark-green, which gives it a singular jewelled appearance.

¹ Mr. Selater finding that his *C. kaupi* was distinct from *C. uniappendiculatus*, Blyth, as no doubt it is, re-named it *C. westermanni* (Proc. Zool. Soc., 1874, p. 247), but, as it would seem, without having ascertained for certain whether it was distinct from *C. papuanus*, Rosenberg.

² See Moresby's "Discoveries and Surveys in New Guinea" (1876), p. 290.

³ Proc. Zool. Soc., 1866, p. 34.

CHAPTER X.

THE PAPUAN CASSOWARY—

Casuarus papuanus, ROSENBERG.

Inhabits Northern New Guinea—Little known concerning its habits—
Described by Rosenberg—Confounded with the last named.

THE reader will have gathered from our remarks under the head of the “One-Wattled Cassowary,” *C. uniappendiculatus*, that some little confusion has prevailed concerning that species and the present, owing, it appears, to the fact, that the young of *uniappendiculatus* has no throat-wattle, and hence for a time resembles *appuanus*, which is destitute of this appendage at all ages.

Little as yet is known of the Papuan cassowary. H. von Rosenberg described and named it¹ from two specimens procured in Northern New Guinea, and which are now preserved in the Leyden Museum. Dr Meyer considers it doubtfully distinct from *C. uniappendiculatus*.² We believe that Professor Schlegel at first identified them with Bennett’s cassowary, but afterwards admitted their distinctness.

The present species, as we have shown (p. 107), is the *Casuarus kaupi* of Selater, although not the bird upon which Rosenberg bestowed the name *kaupii*, in honour of his distinguished countryman and fellow-naturalist.

¹ Journ. für Orn., 1873, p. 39.

² “Ibis,” 1874, p. 417.

CHAPTER XI.

WESTERMANN'S CASSOWARY—

Casuarus westermanni, SCLATER.

A doubtful species—Little known concerning it—Mr. Sclater's description and Professor Schlegel's remarks.

It is with some hesitation that we give this bird a place as a distinct species, the more so because Mr. Sclater, who bestowed the name above-mentioned, seems to have had some little doubt in the matter himself. He says,¹ "This species I established on a bird still living in the Zoological Gardens, which we received from Mr. Westermann in 1871. At first I referred this bird to *C. kaupi* of Rosenberg, until that naturalist showed that the pretended species which he had so named was nothing more than the young of *C. uniaipendiculatus*. I then changed our bird's name to *C. westermanni*."² I have recently (October 1875) seen two other living specimens of this bird in the Zoological Gardens at Rotterdam. It has been suggested that its true home is the island of Jobi in the Bay of Geelvink, where Dr. Meyer ascertained the existence of a cassowary, but was not able to procure specimens."

Speaking of the two specimens of *C. papuanus* in

¹ "Nature," vol. xi. p. 516, 1875.

² Proc. Zool. Soc., 1874, p. 247.

the Leyden Museum, he says (l. c.), "Professor Schlegel at first identified them with the mooruk, *C. bennetti*,¹ but afterwards admitted their distinctness. My belief is that they are probably the same as *C. westermanni*, although the colours of the neck, as restored in the stuffed specimens, do not quite agree."

If this be so, then Mr Sclater's name, *westermanni*, will sink into a synonym for *papuanus* of Rosenberg, the latter name having precedence by a year.

Owing to the variation which is found to exist in the shape and size of the casque, as well as in the size of the neck-wattle and the colour of the naked parts, all which differences are no doubt dependent upon age, sex, and season, it is extremely difficult to pronounce with certainty upon the species of immature examples. We have yet much to learn respecting these very singular birds.

¹ Schlegel, "Observations Zoologiques," in "Nederl. Tijdschr. v. d. Dierk.," vol. iv. p. 33 (1871).

CHAPTER XII.

*THE PAINTED-NECKED CASSOWARY—**Casuarus picticollis*, SCLATER.

Inhabiting New Guinea—Allied to the Moeruk—Particular respects in which it differs from its allies.

DURING the voyage of H.M.S. "Basilisk" in April 1873, the officers of that vessel, while at Discovery Bay on the south-east coast of New Guinea, procured a living cassowary not unlike the mooruk (*C. bennetti*), but differing from it in having a brilliantly-coloured neck, the forepart red, the hinder part blue. On its arrival in this country, it was placed in the Zoological Society's Gardens in the Regent's Park, and the secretary remarking the peculiar respects in which it differed from the other species of cassowary known to him, described and figured it under the name above given in the "Proceedings" of the Society for 1875.¹

Like Westermann's cassowary, it has no throat-wattle, but according to Mr. Sclater differs from that bird in having the colours of the fore and hinder parts of the neck reversed; that is to say, in *C. westermanni* the fore part of the neck is blue, the hinder part red, while in the present species the reverse is the case.

In the mooruk (*C. bennetti*), the neck is entirely blue.

¹ Proc. Zool. Soc., 1875, p. 84, pl. xvii.; tom. cit., p. 349.

Whether *C. westermanni* be distinct from *C. papuanus*, Rosenberg, or not, is at present not quite clear. In order, if possible, to settle the question, Mr. Sclater procured a coloured figure of the head and neck of the typical specimen of *papuanus* in the Leyden Museum, from which, as he says,¹ "it is quite evident that the two species are very nearly related."

Dr. Meyer has suggested² that *C. westermanni* is the cassowary of the Island of Jobi, and *C. papuanus* that of the mainland of Northern New Guinea. *C. picticollis* comes from the south of New Guinea.

In May 1875, Dr. Bennett of Sydney forwarded a young cassowary which had been obtained alive from the natives in Milne Bay, New Guinea, by Mr. Godfrey Goodman, staff-surgeon on board H.M.S. "Basilisk," in 1873. It had died on board, and its skin had been preserved by Mr. Goodman. This bird, supposed to be the young of *Casuarus picticollis*, was still in the first down plumage, and was generally of a pale buffy brown with the head above rufescent. The back was dark, with one median and on each side two lateral broad stripes of pale brown. These stripes ran regularly parallel down the whole length of the back. The whole length of the skin from beak to tail was 10·5 inches, of the tarsus 2·9, and of the bill from gape 2·5.³

The specimen is now in the British Museum.

¹ Proc. Zool. Soc., 1875, p. 85.

² Sitz. Akad. Wien., lxi., p. 217.

³ Sclater, Proc. Zool. Soc., 1875, p. 349.

CHAPTER XIII.

THE MOORUK—*Casuarius bennetti*, GOULD.

A native of New Britain—A living example procured and forwarded to England by Dr. Bennett—Described and named after him by Mr. Gould—Dr. Bennett's account of it.

IN the autumn of 1857, Captain Devlin of the cutter "Oberon" brought to Sydney a species of cassowary which had been procured in New Britain in the South Pacific, where it appears to be known by the name of "Mooruk." It was at once secured by Dr. Bennett of Sydney, and the fact of its existence communicated by him to Mr. Gould, who described and figured it as a new species in the "Proceedings" of the Zoological Society for 1857 (p. 268, pl. 129), and named it after him, *Casuarius bennetti*.

It has no throat-wattle, and may be distinguished from the other species to which it is allied by the different colour of the throat and back of the neck.

Dr. Bennett, in his "Gatherings of a Naturalist in Australia," 1860, gives the following interesting account of this bird, accompanied by an excellent coloured figure of it by Wolf:—

"It was procured from the natives of New Britain, an island in the South Pacific Ocean near to New Guinea, where it is known by the name of *Mooruk*. The height of the bird is three feet to the top of the back, and

five feet when standing erect; its colour is rufous mixed with black on the back and hinder portions of the body, and raven-black about the neck and breast; the loose wavy skin of the neck is beautifully coloured with iridescent tints of bluish-purple, pink, and an occasional shade of green—quite different from the red and purple caruncles of the *Casuarus galeatus*; the feet and legs, which are very large and strong, are of a pale ash colour, and exhibit a remarkable peculiarity in the extreme length of the claw of the inner toe on each foot, it being nearly three times the length which it attains in the claws of the other toes. This bird also differs from the *C. galeatus* in having a horny plate instead of a helmet-like protuberance on the top of the head, which callous plate resembles mother-of-pearl darkened with black-lead; the form of the bill differs considerably from that of the emu, being narrower, longer, and more curved, and in having a black and leathery cere at the base, and behind the plate of the head is a small tuft of black hair-like feathers, which are continued in more or less abundance over the greater part of the neck. The bird is very tame and familiar, and when in a good humour, frequently dances about its place of confinement. It is fed upon boiled potatoes, and meat occasionally. The egg is about the same size as that of the emu, and is of a dirty pale yellowish colour. (I give this description from an egg obtained from the natives.) The bird appears to me to approximate nearer to the emu than to the cassowary, and to form the link between them. In its bearing and style of walking it resembles the former, throwing the head forward, and only becoming perfectly erect when running; it also resembles the apteryx in the carriage of its body, its motion, and atti-

tudes. Its bill presents a good deal of the character of that of a rail; it utters a peculiar whistling, chirping sound, and I am informed it also emits a loud one, resembling the word *mooruk*, whence, no doubt, is derived its native name. The existence of the species in New Britain or some of the neighbouring islands has been suspected for the last three years; and some time since a young specimen was procured, but was unfortunately lost overboard during the voyage.

“I found the bird very familiar and tame in captivity. It was fed principally upon boiled potatoes, soaked bread, and occasionally a little meat. The eyes are of a dark brown colour. The legs are encircled at intervals with black bands. It is probably a male bird. It sometimes rolls about its cage like a dog, its huge legs being often uppermost. It sits on the rump, squatting down occasionally, and is exceedingly playful. A young specimen afterwards arrived in the same vessel, on the 7th of February 1858, at Sydney. In this bird I observed a lighter tint of plumage, more furry or downy than in the adult bird, and the absence of the iridescent colours on the side of the neck and throat. The cheeks were also of a light fulvous-yellow colour, which may be either a distinctive mark of the young bird or a sexual difference. The plate on the head is flatter and less developed, and the legs and feet are of a paler ash colour than in the older bird. On the 26th of February 1858, I succeeded in purchasing the adult bird; and on the evening of the same day (having a comfortable cage made for him), I shipped him safely on board the ship ‘British Merchant,’ under the care of Dr. Plomley and Captain Duthie, for London, as a present to the Zoological Society in the Regent’s Park. I was delighted to

find, by a notice in the *Times*, that this valuable bird had arrived in England on the 24th of May, and was safely deposited in the Gardens.

"I also purchased an egg of this bird and sent it to the Society. I was afterwards informed that two eggs arrived with the bird, one of which was purchased by the British Museum; and the egg I sent to the Society has also been presented to that institution. There is a marked difference between the two eggs: mine measures $5\frac{1}{2}$ inches in length and $3\frac{1}{2}$ inches in diameter; the other is larger, and differs from it in general appearance. The colour of the egg of the mooruk is a pale greenish-yellow, faintly crenulated with green; the other is shorter, broader, and deeply crenulated with pea-green markings, closely resembling that of *C. galeatus*. I am of opinion, on examining all the eggs (four) in my possession, and those now in the British Museum (altogether six), and comparing them with the egg of *C. galeatus* in Mr. Gould's collection, that Dr. Gray's conjecture¹ respecting there being two species of cassowary in New Britain may yet be verified (that is, allowing my information to be correct, that all the eggs were brought from the same island), although we may sometimes find the colours of the eggs of the same bird to vary from exposure to the sun and other atmospheric influences. Dr. Gray says, "The egg of the mooruk is of the same form, and has the same solid shell, covered with rounded tubercles, as that of the common cassowary (*C. galeatus*). It differs from the egg of the latter bird in the British Museum in being rather larger (it is $14\frac{1}{2}$ inches in circumference in the longest, and $11\frac{1}{2}$ inches in the thickest part), and

¹ J. E. Gray, Proc. Zool. Soc., 1858, p. 271, pl. 144.

in the tubercles on the surface being larger, considerably further apart, and more isolated, that is to say, more rarely confluent. The egg is pale olive-green, with darker olive tubercles. It is much darker than the eggs of the cassowaries in other collections; but they may have become faded, as is the case with our specimens in the British Museum."

Dr. Bennett sent with the living specimen of the mooruk an egg which was brought from New Britain with the bird. This egg has been presented by him, through the Society, to the British Museum. It differs very considerably from the other; first, in being smaller, that is to say, only $13\frac{1}{2}$ inches in circumference and 11 inches in the thickest part; secondly, in the egg being blunter, more rounded in front, and not so conical as the other; thirdly, it is of a uniform pale olive colour, without any appearance of tubercles or darker spots. It has been suggested that the difference between the two eggs is so great, that they cannot have been laid by the same species of bird. They differ considerably from the egg of *C. galeatus*. They were both brought to Sydney with the living bird, so that if they are not the eggs of the mooruk, it would indicate that there must be two cassowaries inhabiting New Britain, both different from *C. galeatus*. There is so great a similarity in the colour and texture of the smooth egg with the ground-colour of the other egg between the tubercles, that it has been suggested that the tuberculated egg is the perfect egg of the bird, and the smooth egg that of a very immature or sickly specimen.¹ One egg, given to him by Mr. Thomas Dawson of Sydney, closely resembles the egg of the

¹ Proc. Zool. Soc., 1858, pp. 271, 272, and fig.

common cassowary; it is very bright in colour, and has a yellowish-green ground, crenulated with vivid pea-green markings.

The mooruk was procured on that part of the coast of New Britain lying between Cape Palliser and Cape Stephens, at a native village under three hills, named by navigators "The Mother and Daughters," situated in St. George's Channel, between New Ireland and New Britain, opposite Amataka, or Duke of York's Island. . . .

"The bird," says Dr Bennett, "was brought off by the natives to the vessel for sale. Captain Devlin informed me that they capture them when very young, soon after they are hatched, and rear them by hand, but can rarely or never capture the adult, from its being so shy and difficult of approach. They are exceedingly swift of foot, and possessed of great strength in their legs. On the least alarm they elevate the head, and on seeing danger, dart among the thick bushes, thread localities where no human being can follow them, and disappear with incredible rapidity. The mooruk, with its powerful legs and muscular thighs, has an extraordinary power of leaping, and it was from this circumstance that the first specimen brought from New Britain was lost. One day when allowed to be at liberty, it made a spring on the deck, and went overboard; as it was blowing a strong breeze at the time, the bird perished. . . .

"Their wings aid them in running, but are never used for defence. . . .

"The mooruk is a robust bird, and differs from the ostrich in its internal anatomy, its digestive organs being adapted only for a soft and nutritious diet—fruits, vegetables, insects, and eggs; grain, or any similar hard substance, not being digestible unless it has been previ-

ously boiled ; it also requires a quantity of small gravel or pebbles to aid in the trituration of its food, and often picks up nails and small bits of iron for a similar purpose. . . .

I never heard them utter a sound like "Mooruk : " I am inclined to consider the name signifies in the native language, "swift," resembling closely the Malay term "a muck," or mad career ; and the extraordinary rapid movements of these birds, which I shall have occasion to relate further on, rather confirm my idea on this subject. . . .

The chirping sounds of the mooruk are very peculiar, being modulated according to the urgency of their wants and desires. Sometimes these notes are varied, as if speaking ; at one time they are mild, at another very vehement ; then rising to a higher and more rapid chirp, as if scolding ; afterwards becoming plaintive, as if beseeching for something ; again loud and rapid, as if impatient at delay. At a little distance this modulation of the chirping notes seems as if the birds were holding a conversation, and has a very singular effect. . . .

The emu kicks outward and backward ; but these birds always kick in front, elongating the body at the same time. . . .

The plumage varies in length, according to its situation on the body ; the longest feathers are about the rump and back, and the shortest about the neck ; descending to the back, they fall over the body, have more the rough appearance of hair than feathers, and readily throw off wet from the surface. Each shaft has two plumes growing out of it, and is covered with fine down. The rudimentary wings are very small, and when they spread them out, look as if amputation had been per-

formed by a skilful surgeon; the number of spines on each wing is four. The male has a bare red space on each side of the neck, extending slightly under the throat; it imparts to the bird an appearance as if it had received an injury, and the feathers had been rubbed off; around the ears, and extending towards the upper part of the head, is a cere of a deep blue colour; this blue mark exists also in the bird we call the female, but it has not the bare red space on each side of the neck.

. . . . They are very clean birds, and their plumage is always kept in fine shining condition; they only enjoy a bath during the warm season of the year, as they seek refuge from rain during the colder months."

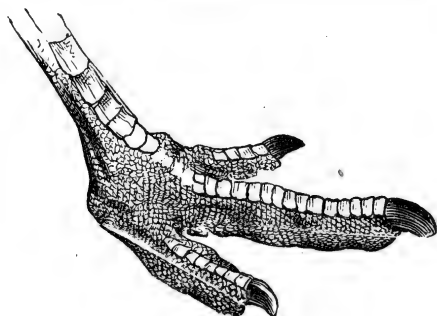
Individuals of this species, as we learn from Mr. A. D. Bartlett, have bred in the Gardens of our Zoological Society. In June 1863, a single young one was hatched there, but did not live. The female began to lay in the middle of March, and deposited eggs at intervals of about eight days. The male bird commenced the duties of incubation on the 25th March, when five eggs had been layed. One more was subsequently added. On the 17th June, after an incubation of fifty-two days, a single young one was hatched. It was very weak, however, and only lived a few hours. Its portrait, beautifully drawn by Mr. Wolf, will be found in the "Proceedings" of the Society for 1863, pl. 42. The following year in June, two young ones were hatched and reared.

CHAPTER XIV.

THE EMU—Dromæus novæ-hollandiæ.

The Emus—In what respects they differ from the cassowaries—Two species now recognised—The common emu of Australia—*Dromæus novæ-hollandiæ*—Description of the species—Its geographical range—Its value in Australia—Former abundance—Domestication—Habits in confinement.

THE emus, as before remarked, differ from the cassowaries, their nearest allies, in having the head completely feathered, and in having no casque. In the cassowaries the beak is compressed laterally with a high



Foot of Emu.

ridge or keel, which in the emu is broad and depressed. Like the cassowaries, they have three toes, but the nails are all short and robust, instead of being extremely long and pointed.

The wings are so short as to be quite invisible when close to the body, whilst their situation in the casso-

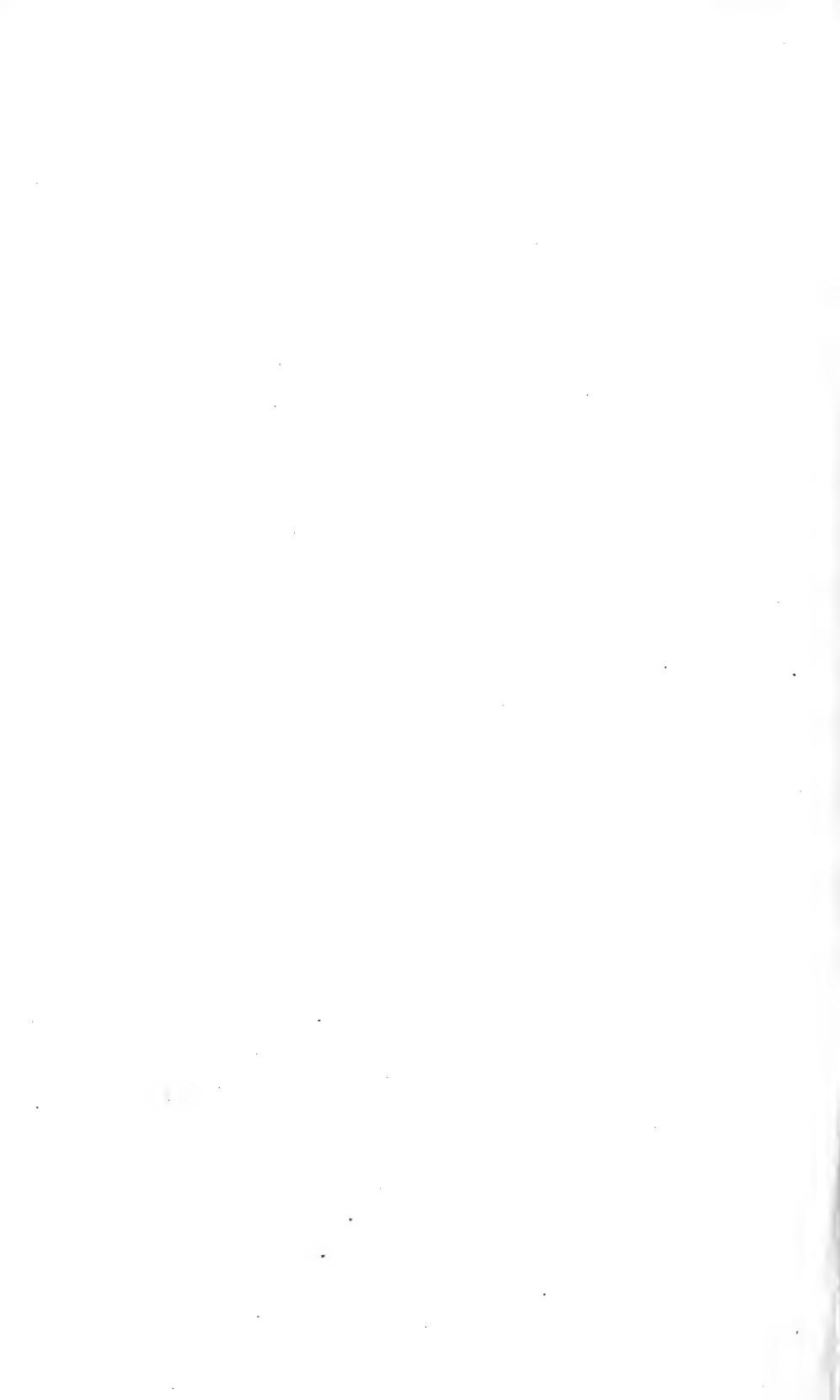
varies is indicated by the long, stiff, pointed shafts, generally five in number, black in colour, and of unequal length, which protrude through the plumage.

“The entire plumage of the adult bird is of a light brown, mottled with dirty grey in some parts; the head and neck are thinly covered with short feathers, displaying the purplish skin around the throat and ears. The young emus are very pretty, being of a greyish-white colour, with two stripes of black down the back, and two others on each side, each subdivided by a narrow middle line of white—these stripes being continued along the neck without subdivision, and broken into irregular spots on the head; two other broken stripes pass down the fore part of the neck and breast, and terminate in a broad band across the thighs. There is but little variety of plumage in the two sexes. Irides brown; the bill and legs dusky black. The bill is straight, very much depressed towards the sides, slightly keeled along the middle, and rounded at its extremity; nostrils large. Toes three, directed forwards. The feathers have more the appearance of hair than the usual plumage of birds, the barbs being all loose and separate; and a peculiarity in their structure is, that each feather appears to be double, from the elongation of the accessory plume. Mr. Yarrell observes, “The four genera of struthious birds afford remarkable instances of the variety that occurs in this accessory plume, even in subjects so closely allied. In the ostrich, the feathers have no accessory plume. In the rhea, there is a tuft of down. In the emu, the accessory plume is augmented to the full size of the principal shaft and web, and the feather of this bird is constantly, and correctly, represented as having two plumes on one quill. In the cassowary, besides the



THE EMU, *Dromæus Novæ-Hollandiæ*.

To face page 132.



double shafts and webs from a single quill, as in the emu, there is still an accessory plume, thus forming three distinct parts."

In regard to its internal structure, the emu differs in certain details both from the cassowary and the ostrich; and on this part of the subject the reader may be referred to Mr. W. K. Parker's remarks on the skull and other portions of the skeleton,¹ to Dr. Haughton's account of its muscular anatomy,² and to the description of the tracheal pouch and heart, by Dr. Murie³ and Mr. Coughtrey.⁴

For a long time it was supposed that there was only one species of this genus, which is exclusively confined to Australia, and it was asserted by Sturt,⁵ that it ranged over the whole of the Australian continent, although he did not see any to the north of the Stony Desert. Those he saw in the distant interior, he says, did not differ from the common emu.

In 1859, however, Mr. Bartlett, the able superintendent of the Zoological Society's Gardens, pointed out certain peculiarities in an adult and two immature specimens then recently received, which seemed to indicate that in Western Australia there was a second species of emu, smaller and in other respects distinct. Of this bird we shall have occasion to speak later.

In size and bulk the common emu is exceeded by the

¹ Parker, Phil. Trans., 1866, pp. 113-183, and *Encycl. Brit.*, 9th ed., art. "Birds."

² Haughton, *Proc. Roy. Irish Acad.*, vol. ix. p. 487.

³ Murie, *Proc. Zool. Soc.*, 1867, p. 405.

⁴ Coughtrey, *Proc. Liverp. Soc.*, 1872-73, p. 293; *Ann. Nat. Hist.*, vol. xii. pp. 217 and 327. See also Duchamp, *Ann. Sci. Nat.*, vol. xvii. Art. 11, pp. 1-12, pl. 22.

⁵ Sturt, *Exped. Central Austr.*, vol. ii. *Append.* p. 47 (1849).

African ostrich alone. "Its average measurement," says Mr. Gould,¹ "may be estimated at between five and six feet in height. In form it closely resembles the ostrich, but is lower on the legs, shorter in the neck, and of a more thick-set and clumsy make. At a distance its feathers have more the appearance of hair than of plumage, their barbs being all loose and separate. As in the ostriches, they take their origin by pairs from the same shaft. The wings are so extremely small as to be quite invisible when applied to the surface of the body. They are clothed with feathers exactly similar to those of the back, which divide from a middle line and fall gracefully over on either side."

"Its flesh has been compared to coarse beef, which it resembles, according to Mr. Cunningham, both in appearance and taste, and is good and sweet eating; nothing indeed can be more delicate than the flesh of the young ones. There is but little fit for culinary use upon any part of the emu, except the hind quarters, which are of such dimensions, that the shouldering of two hind-legs homewards for a mile distance once proved to me as tiresome a task as I ever recollect to have encountered in the colony. I may remark, that its flesh proved of the greatest service to Dr. Leichhardt and his intrepid companions during their overland route from Moreton Bay to Port Essington, in the course of which, but more particularly between the head of the Gulf of Carpentaria and Port Essington, the sight and capture of the emu was almost a daily occurrence; so abundant in fact was it, that he states he saw in the short space of eight miles at least a hundred, in flocks

¹ "Handbook to the Birds of Australia," vol. ii. p. 201.

of three, five, ten, and even more, at a time. Dr. Leichhardt mentions that the natives, on killing an emu, invariably break the wings; why, he was at a loss to conceive, as they could but slightly assist the animal in making its escape should it survive; some curious practices also exist with respect to this bird among the natives, the particulars of which I have not been able to learn, but I may mention that the young men and boys are not allowed to feed upon it.

“On the continent of Australia, the emu was formerly abundant about Botany Bay and Port Jackson Harbour, but is now only to be seen on the plains of the interior, over whose solitudes it still roams in great numbers, and where it breeds, depending upon the strength and swiftness of its legs to avoid the pursuit of the stockmen and their dogs. Further and further back, however, will it be driven, until it be extirpated, unless some law be instituted to check its wanton destruction. That it might easily be preserved, is evident from the readiness with which it breeds in confinement; and surely I have here said sufficient to induce the Australian authorities to give a thought to its protection, as well as that of the great red and grey kangaroos and other interesting native birds and quadrupeds.

“The note of the emu is a low booming or pumping noise, which we know is produced in the female by means of the expansion and contraction of a large membranous bag, surrounding an oblong opening through the rings of the trachea; but whether this peculiarity of structure is also to be found in the male, I am not aware.

“They pair with tolerable constancy, and the male bird appears to take a large share in the task of incubation.

"The eggs, which are merely placed in a cavity scooped in the earth, generally in a sandy soil, are six or seven in number, of a beautiful dark green, resembling shagreen in appearance; $5\frac{3}{4}$ inches in length, by $3\frac{3}{4}$ inches in breadth. They are held in much esteem by the natives, who feed upon them whenever they can be procured.

"Little or no difference of colour is observable in the sexes; but I believe the female is always smaller than the male."

Sturt states that a good many were killed by the dogs at Fort Grey. They travel many miles during a single night to water, as was proved by a pack of thirteen coming down to the Depot Creek that had been seen the evening before more than twelve miles to the north.¹

"To see the emu in its wild state," says Dr. Bennett,² "the far interior of Australia must be visited; and unless attention is paid to rearing them, the time is not far distant when this noble bird will have met the fate of so many of the wingless birds, and become extinct. In visiting the interior of Australia in 1832, I travelled some hundreds of miles before even a solitary specimen was seen; and then, instead of the flocks heard of in the early periods of the colony, consisting of a dozen or more, I only saw two or three at the utmost, and usually only a solitary bird. The part of the country I allude to is now well settled, and the emu is seen there no more." "About the Murrumbidgee and Tumat this bird is named by the blacks '*Gorin*' and '*Berebine*.'³ It is

¹ Sturt, Exped. Central Austr., vol. ii. Append. p. 47 (1849).

² "Gatherings of a Naturalist in Australia, p. 216."

³ This is in New South Wales. In Victoria, according to the late Mr. Wheelwright (the Old Bushman), it is known to the natives as "*ourer*."
—"Bush Wanderings of a Naturalist in Australia," p. 61.

principally valued by the stock-keepers for its oil, the skin of a full-grown bird producing six or seven quarts, which is clear, and of a bright yellow or golden colour. The method adopted for extracting or trying the oil is to pluck the feathers, cut the skin into pieces, and boil it. The oil is also valued for burning in lamps, producing no disagreeable smell. It is likewise considered a good embrocation for sprains and bruises of horses and cattle, either alone, or mixed with turpentine when stronger stimulating properties are required. The blacks eat the flesh with the skin upon it, regarding it as a highly luscious treat, as the Esquimaux luxuriate on the flesh of whales and seals."

Leichhardt thus describes the method he adopted to extract the oil from the skin:—"We busied ourselves in extracting the oil from the skin of the emu. This operation was performed by suspending it on sticks before a gentle fire, the oil dripping from it into a shallow vessel. It is of a light amber colour, and is very useful in oiling the locks of our firearms. It has been considered a good anti-rheumatic, and I occasionally used it for that purpose." The fat accumulates in the emu about the rump and between the scapularies and the sternum, but is also diffused over the whole skin. It is of a light-yellowish colour, tasteless, and free from smell when in a recent state. Leichhardt says: "Several times, when suffering from excessive fatigue, I rubbed it into the skin all over the body, and its slightly exciting properties proved very beneficial."

"The emu," observes Dr. Bennett, "crops herbage like the cow or horse, and feeds upon various fruits; it possesses great keenness of vision. The flesh is eaten by the settlers, and by some is preferred to the kangaroo;

the rump part is considered as delicate as fowl ; the legs coarse, like beef, but tender when the animal is young. The fibulæ of the legs are used as ornaments by the blacks. The best time to hunt these birds is at an early hour in the morning, when they are seen cropping the tender grasses. They are swift of foot ; but as soon as the dogs reach them, which is not until they are completely tired out, they are speedily overthrown and killed."

"The Earl of Derby found the emu to be strictly monogamous, not approaching any female but the favoured one. The formation of their nest is very simple ; they usually select a situation in a scrub upon the hills, where they scrape a space similar to those made by brooding hens ; sticks and leaves are left about and upon the cleared place ; in this the eggs are deposited without regard to regularity, the number varying from nine to thirteen ; and it is a curious circumstance that it is always an odd number, some nests having been discovered with nine, others with eleven, and others again with thirteen eggs. It is now ascertained beyond doubt that the eggs are hatched by incubation ; they are of large size, some measuring about six inches in length, with a diameter of three and a half inches, but some are smaller than others ; they vary in colour, from a beautiful bluish-green to a dark bottle-green colour.

"The emu is found on the plains and open forest country ; the kangaroo on the hilly ranges. Many of the Australian fruits are eaten by the emu, more especially the quandong or native peach (*Fusanus acuminatus*), which, when in season, is its favourite food.

"The kick of the emu is its only means of defence, and it has proved so formidable as to disable dogs that have

attacked it; the blow is given backward and outward, in a manner similar to that in which a cow kicks.

“At Sydney some very elegant and useful ornaments have been made of the eggs, mounted in silver, as milk-jugs, sugar-basins, &c. ; but I find that the egg, exposed to the glare of the sun, soon loses its beautiful green colour, and becomes of a brownish hue.”

In Collins’s “Account of New South Wales” we find that emus were formerly very numerous at Rose Hill, near Paramatta; they were seen in flocks of twelve. Two emus wandered into their camp, and were so intermingled with the people, who ran out of their tents at such a novel sight, that it was dangerous to fire at them, and they got clear off, though literally surrounded by men, and under the muzzles of some of their muskets.

“The emu,” continues Dr. Bennett, “being a vegetable feeder, care is required to prevent the tame birds from entering a garden, as they prove very destructive to the fruit. Emus, whether tame or in their wild state, evince great curiosity at the approach of any object with which they were not previously acquainted. I once saw a fine pair of full-grown specimens in a paddock near Sydney. Stopping to observe one which was at a short distance from the fence, he immediately came down to have a look at me. The second bird was some distance off, but, with their usual keenness of vision, on perceiving me viewing his companion, he came stalking down rapidly, and they both stared at me most attentively, stretching out their necks for the sake of making a nearer acquaintance; when, finding no result from our interview, and their curiosity being satisfied, they quietly stalked away. In the Domain, near the Government House, some tame emus may be seen walking about, and often, near the Guard-

house, marching with measured pace, as if keeping guard with the soldiers on duty. One day, during the levee, when the Domain was crowded with people to see the arrivals and listen to the band, the emus mingled with the crowd, apparently enjoying the gay scene around them, when some strangers, who were afraid of these birds, ran away. On seeing this, the emu (enjoying a chase) pursued, and overtaking one of the gentlemen, took off his hat, to his great surprise. The above circumstance demonstrates their fearless nature, and how readily these noble birds might be domesticated.

“The only sound emitted by the emu is a sort of hollow booming note. It is considered to be produced, in the female, by means of the expansion and contraction of a large membranous bag surrounding an oblong opening through the rings of the trachea.

Although emus are so scarce that a traveller may journey hundreds of miles in the interior of Australia without seeing one, yet, in an unfrequented part of the country not fifty miles distant from Sydney, where they have been left undisturbed, between twenty and thirty of these birds were observed together a short time ago, showing that, if left unmolested, they rapidly increase.

Dr. Bennett tells us that dogs accustomed to hunt the emu invariably seize it by the neck, and dragging it down, kill it; but such as are not in the habit of hunting this bird seize it by the leg, from which they receive a kick that often injures them severely. Major Mitchell, writing on the chase of the emu, says¹: “It is one thing for a swift dog to overtake an emu, and another to kill or even to seize it. Our dogs are only now learning to

¹ “Three Expeditions into the Interior of Eastern Australia,” 1839.

seize emus, although they had chased and overtaken many. To attempt to seize them by the side or leg is dangerous, as an emu could break a leg with a kick ; but if they seize them by the neck, as good dogs learn to do, the bird is immediately overthrown, and easily killed. The flesh resembles a beefsteak, and has a very agreeable flavour, being far preferable to that of the kangaroo."

From its hardy nature and herbivorous habits the emu is readily domesticated, and many successful experiments have already been made in this country with a view to acclimatise the bird here. Amongst other successful breeders of emus was the late Duke of Newcastle, who had several of these birds at large in the beautiful grounds of Clumber. Mr. W. B. Tegetmeier, who some years since paid a visit to Clumber¹ for the purpose of inspecting the aviaries there, and was especially interested with the young emus, has been good enough to furnish us with the following extracts from an account which he published at the time in the natural history columns of "The Field." He says:—

"I am strongly inclined to think that the emu might be a profitable addition to our somewhat meagre list of domesticated animals capable of yielding food for the use of man. The birds are perfectly hardy, refusing the shelter of a shed during the severest weather; exclusively herbivorous—not even, like turkeys or ordinary poultry, requiring grain, which if given unground passes through the body without change.

"The chief food of the adult bird is grass. Those at Clumber graze with the cows and horses in an open

¹ "The Field," 12th September 1868.

field, and are fond of cabbage, lettuce, or any garden refuse. During the laying season they are also supplied with a proportion of meal mixed with water, or soaked ship-biscuits. For their size and weight they are unquestionably small eaters. They are readily kept within bounds by ordinary fences, never attempting to force through a hedge or pass over a gate. They are also very prolific, the hen laying nearly thirty eggs every season. It is true that these are more than the male bird can cover; but there appears to be no valid reason why a portion of the eggs should not be hatched under turkeys without the slightest difficulty. When to these recommendations we add their strangely picturesque appearance as seen walking at a short distance, I can conceive no more useful or attractive addition to the fauna of an enclosed park.

“The pair of birds at Clumber were then four years old; the female laid for the first time early in the year 1867. During the year 1868, of which only I have any accurate record, she commenced to lay on January 5, and laid every second or third day until she had deposited twenty-seven eggs, which were placed on the floor of a shed, which opens into the small enclosure in which the birds were confined at that time. After seven eggs had been deposited the male proceeded to sit upon them, and sat steadily for eight days, when the female disturbed him, and he left the nest for eight days—the eggs being exposed during the whole of this time to the severe weather of February. At the end of this period the cock resumed his task of incubation, and sat for sixty-two days after the commencement of the second incubation. At this time Mr. Douglas thought that the health of the bird would suffer from the long-continued

confinement and abstinence from food, as he refused to eat anything whilst on the nest, although food and water were placed within his reach, and he only came off the eggs three times during the long period of incubation.

As the date at which the eggs should have hatched, counting from the first commencement of incubation, had passed, it was feared that they were not fertile; but on placing them in warm water their active motion soon testified to the existence of living emus within. They were consequently returned to the nest and hatched in due course. Of the seven eggs, one was rotten, two young emu chicks died in the shell, and four were hatched, one of which was accidentally killed by the male.

“Of the remaining eggs, several were eaten, and found of unquestionable excellence. They weigh about one pound and a quarter each.

“The young at birth are most interesting-looking creatures. In colour they do not resemble the mixture of dull brown and grey that characterises the loose plumage of the old birds, but are striped longitudinally on the sides like a zebra, the markings being dark on a light ground. Fearful of any injury that might arise from the parents, the young emus were reared by hand, being for a few days crammed with chopped lettuce, rib grass, clover, leaves, and custard. Before the end of the first week they had learned to feed themselves, and their chief food now consists of grass, rib-grass (*Plantago lanceolata*), cabbage, clover, with some bread and meal. Their mode of drinking is peculiar. They spoon the water up with the lower mandible, and allow it to run to the back of the mouth. They are now about four feet high, and weigh about 16lbs. to 18lbs. each. They are

so tame that they became a trouble when at large, as they could not be kept out of the house; and now they run towards any one approaching the enclosure, uttering a soliciting note of "peep, peep," very unlike the pumping sound uttered by the adult female.

"Their gambols and play are strangely peculiar. The wings are so very rudimentary that the action is entirely confined to the neck and legs. They leap, they kick out with one leg, roll on their sides and backs, kicking with both legs; again they leap up, and chase each other in the most good-humoured frolic."

The remarks already made with regard to the domestication of the South American rhea for the purpose of food (p. 84), apply equally well to the present species. No species of the ostrich family is more readily domesticated.

In the Zoological Society's Gardens, these birds have several times reared their young. In France several successful experiments have been made to acclimatise them, and the advantages to be derived from the domestication of this species have been pointed out by M. Touchard, in a very interesting article in which he has given the results of his own experiments.¹

In the royal park at Buen-Retiro, near Madrid, as we learn from Señor Graells, the emu has thriven well and reared its young,² and a like success has attended similar experiments at Vienna.³

¹ Bull. Soc. Imp. Acclim., 1867, pp. 2-7. See also Le Prestre, *op. cit.*, 1870, pp. 104-121.

² Graells, *op. cit.*, 1861, p. 559; 1862, p. 91.

³ Hartmann, Zool. Gart., 1866, p. 69.

CHAPTER XV.

THE SPOTTED EMU—Dromæus irroratus, BARTLETT.

How distinguished from the common species—Inhabits Western Australia
Dr. Bennett's account of it—Easily domesticated—Its successful acclimatisation in England by Mr. W. Bennett.

ALTHOUGH it was for a long time supposed that only one species of emu existed in Australia, there seems to be now good reason for believing that in the western portion of that continent a second species is found, which is smaller and somewhat differently coloured.

At a meeting of the Zoological Society in May 1859, Mr. Bartlett, superintendent of the Society's Gardens, exhibited an emu then recently received with two others from the interior of South Australia, upon which he made the following remarks :—

“It differs from *Dromæus novæ-hollandiæ* in having the whole of the feathers of the body distinctly marked with narrow transverse bars of light-grey and dark brownish-black. The feathers of the back and sides are broader, longer, and less silky in texture than those of the common species, the latter difference being quite evident to the touch; the upper part of the head and neck is nearly black, and the feathers appear thicker than those of the same parts in the other bird.

“The specimen to which these remarks refer was one of three examined by me, two of which were adult and

one a young bird about one-third grown. The latter exhibited the transverse bars on its plumage as distinctly as the adult bird, and the broad longitudinal stripes were clearly to be seen. Judging from the skins I have seen, I am inclined to consider that this new bird is smaller than the common species. I beg to propose, provisionally, the name of '*Dromæus irroratus*' for this supposed new species."

Mr. Gould having seen adult and young examples of this emu, all bearing the characters which suggested its specific name, has no doubt of its being distinct from *Dromæus novæ-hollandiæ*. He is almost equally certain that it is confined to the western division of Australia, and that it represents there the emu of the eastern. Whether the two species inosculate in South Australia, and whether the present bird extends its range to the north and north-western coast or not, future research must determine.

In the "Proceedings" of the Zoological Society for 1860, p. 247, Mr. Sclater, referring to *Dromæus irroratus*, says, "I have lately had the pleasure of examining two specimens in Holland. One of these, now in the gardens of the Zoological Society of Amsterdam, was brought from Albany in Western Australia, and thus renders it probable that the spotted emu is the western representative of *Dromæus novæ-hollandiæ*. The second, now in the Zoological Gardens at Rotterdam, I have obtained by exchange for this Society. The emu of Western Australia (as was pointed out by Mr. Bartlett when he first described it) may be easily distinguished from the well-known eastern bird by its spotted plumage. On comparing the feathers of the two species together, the mode in which this spotting is pro-

duced is clearly apparent. The feathers of *D. irroratus* are barred alternately with silky white and darkish grey throughout their length, terminating in a black tip margined posteriorly with rufous. Those of *D. novæ-hollandiæ* are uniform blackish grey from the base to the extremity, which is black, with a black terminal band of rufous. On comparing the two living birds, we find *D. irroratus* generally of a much more slender habit. The tarsi are longer and thinner, the toes longer and much more slender, and the tarsal scutes smaller. The irides are pale hazel, instead of reddish brown, as in *D. novæ-hollandiæ*. As Mr. Bartlett's original skin of *D. irroratus* was obtained in the interior of Southern Australia, the range of this emu may be supposed, to extend over the western portion of Australia into the latter colony, where it probably inosculates with *D. novæ-hollandiæ*. Two additional specimens of the spotted emu (both immature) have been lately received by the Society from Swan River. In this state of plumage the bird is decidedly darker than its near ally."

The spotted emu appears to be as hardy a bird and as readily acclimatised in this country as its congener. Mr. William Bennett of Betchworth, Surrey, has been particularly successful in breeding and rearing this species, and to show how easily this may be achieved by others who may have similar opportunities, we cannot do better than quote the extremely interesting account which he has given of the experiments made by him. He says¹—

"On the 23d of June 1860, by favour of the late

¹ "The Zoologist," 1863, p. 8313; and 1864, p. 8323.

Captain Neathy, of the 'Duncan Dunbar,' I received a pair of emus, just imported by him from Sydney. They were somewhat unmanageable when first landed; and proving too large, and requiring too much room for the person at Sydenham for whom they were originally intended, they were kindly taken in for a short time by the authorities of the Crystal Palace, from whence they were removed here direct.

"The first thing was to provide the best conditions I could to make them comfortable. For this purpose a space or paddock of about a quarter of an acre, well shaded on one side, with a southern slope towards the River Mole, was enclosed by iron hurdles, with the house in which they were imported placed in one corner for night shelter. They were protected from the river, because, though fond of water, they do not know how to manage themselves out of their depth, the bottom in this part being very uncertain and full of great holes. As soon as their propensity for bathing was discovered, a pond of a graduated depth was made for the purpose, in which they disport themselves precisely in the manner of a fowl in a dust-bath. They were driven into the house the first two or three nights; but exhibiting an invincible repugnance to this process from the moment they obtained their freedom, and not appearing to suffer, they were ever after left to their liberty in this respect; and though it was resumed in the winter, they never voluntarily sought shelter in any weather beyond that of the trees, but generally settled in the dampest spot they could find for the night. They did not appear at all to suffer even from being out in the snow, and I have seen them eat pieces of solid ice thrown out of the water-bucket, though their acquaintance with either of

these phenomena, I apprehend, must be very rare in their native country.

“From the moment the birds came into my possession, I put myself in communication with the Zoological Gardens, Regent’s Park, in order to learn what I could of their habits, food, and treatment. The staple food is dog-biscuit, broken up into moderately small pieces, as the emu has no means of mastication or fracturing, varied with bread, boiled rice, Indian-corn occasionally, with a large proportion of chopped-up vegetables, such as lettuce and cabbage, greatly preferring the former, or, in its deficiency, any other succulent milky sort will do, as dandelion, sow-thistle, &c. They are also very fond of fruit of any kind, in any condition of maturity, from the smallest apples that begin to fall, green gooseberries, unripe or ripe strawberries or raspberries, up to grapes or even wall-fruit, so that it is not decayed, about which they are very particular. The apple-parings are all saved for them in winter time. They feed likewise considerably on grass, some kinds of leaves, and will pick up green acorns; so that their bill of fare offers no anxiety. The young birds are fed on meal, mixed with hard-boiled egg and vegetables chopped fine, together made into a ball with water or milk, dry enough to crumble. Besides their adult stock they had at that time one young one in the gardens, hatched by means of an incubator and nursed by a great cochin hen. It was amusing to see the tall long-legged bantling trying to nestle to its strange foster-mother. The poor little thing lived to about four months and then died of diphtheria. The young emus are full-fledged and striped longitudinally, and nestle with their heads only beneath the parent bird.

“From the information of the captain, my birds were either in their fifth or sixth year at the time of their arrival, and of course at full maturity. They appeared to prosper well, and improved in feather considerably. They became also much more gentle in manner, and at times very playful, with the most grotesque attitudes in the way of dancing, sometimes performing a regular pirouette, with their tall figures and feathers acting as crinoline.

“The severity of the winter was passing, when one morning, the 9th of February 1861, on a heap of litter just outside the emu-house, and slightly concealed by the straw being drawn over, was discovered an egg. When first brought to me, having no idea there was any egg of that colour and character, I thought it the most wonderful natural production I had ever seen. It was very heavy, of a perfectly symmetrical form, dark green in colour, slightly fretted or shagreened, and looking more like a mass of polished malachite than any organised product. The beauty of the shell was displayed in the late International Exhibition, where the emu's egg might be seen made up into ornamental drinking-cups, mounted in silver, of a variety of patterns, in the Australian department.

“I communicated directly with the Zoological Gardens, and was duly informed that the egg was a perfectly normal one, that I might expect a batch of from ten to fourteen, at intervals of about three days each, and that in due course, if things went on favourably, the male bird would collect the eggs together in a rude sort of nest, would sit indefatigably for the long period of eight weeks, and would wholly take the charge of, tend, and bring up the young ones when hatched.

“My second egg was not laid till the ninth day, and then I was presented with one every third day regularly, up to the thirteenth egg, which took four days in making its appearance, and was the largest and heaviest of the batch, weighing 1 lb. 5½ oz. They had steadily increased in size and weight from the first. After the deposit of the second outside the house, being still cold weather, and anxious to secure their vitality, I replaced each egg by imitation ones I had made and painted, and succeeded in inducing the process to take place while the birds were within the house at night. As the number increased, the two first real eggs were put back, in order to run as little risk as possible of dissatisfying the bird, and subsequently they were left as laid. They all underwent the process of arrangement and rearrangement with every addition. One morning I found one of the birds busily engaged in shifting the eggs in the usual manner with its beak, and suspicion of its intentions being excited, I watched it till it succeeded in rolling one out of the house. I replaced it. The same thing was repeated the following morning. As there was a fall of snow of several inches, ‘This won’t do,’ says I to myself, for fear of breakage, and I set my thoughts to work to interpret the meaning. I came to the conclusion that it was a certain indication the bird would not sit in that house, but was in search of some other place. By observing narrowly I noticed a partiality to one particular and moderately sheltered corner of the open ground, not very far off. I immediately had four poles erected, and an awning put over a sufficient space; under this was scooped out a slight hollow, a layer of sand placed therein, with a covering of dry litter, and the nest-eggs removed thereto. To my great

satisfaction the next egg was laid there, and on the 24th of March 1861 the bird finally sat down.

Now comes the proper time for the question, Which bird really was it? The next day, as soon as I was satisfied the bird was fairly settled, I hastened up to the Zoological Gardens and informed the authorities of my success so far, and that their information was correct in every particular, except that my *female* bird was the one that, *secundem artem*, had taken to the nest—at least, the one the captain who imported them said, and I had always taken to be, the female emu. With this the keeper seemed very much surprised and dissatisfied, and began to question whether I really had the sexes. Upon his cross-examining me as to the marks and signs, especially as to the voices of the two birds—upon the evidence of which I had greatly relied as determining the one with the deep and distinct call being the male bird—he assured me I was mistaken; that that bird which was still at large with me was the female, and that consequently it was the male bird that had normally sat down. I was still, I confess, incredulous.

“It is proper here to observe that in the emu, as in several other Australian species, there is no characteristic male plumage, or rather the little difference there is, and various other usual outward signs, is *reversed*. Of my pair, one is considerably larger than the other, stouter in limb, and more robust in every feature; it has a slight top-knot, and goes strutting about, especially in damp weather, with its breast-feathers fully out, like a pouter pigeon, or rather some huge turkey-cock. It is usually the more courageous and pugilistic. It makes a deep, hollow, guttural boom when under any gentle excitement of pride or pleasure, especially on damp

evenings, or in the still hours of the night, sounding like a small gong or distant muffled drum. The other is more agile and graceful in all its movements, corresponding with its slenderer frame, more docile and inquisitive, fleet of foot, and with no voice beyond a suppressed hiss when angry, and a sort of grunt when distressed. The former is the one we took to be the male, the latter the female, and all our visitors, farmers and other natural judges, who had the opportunity of observing their manners, agreed in the opinion. It was this last which took sole notice of the eggs (they were usually laid at night, when the birds were always together, so that it was not detected *which* actually laid them the first season), in the way of arranging and concealment, and that finally sat down upon them.

“For the first month the bird sat most assiduously, not being observed to come off the nest for the necessary food and water oftener than twice in the week, and then for scarcely more than a minute at a time. Nine eggs was the number the birds had been set upon. Three were taken to the Zoological Gardens to be tried by an incubator. One or two got accidentally broken. The first good observation that was obtained of the nest when the bird was off, there were found to be *twelve* eggs in it, so that three more had been laid in to the original number. Which bird deposited these last? The total number of eggs was sixteen.

“During the fifth week the bird became restless, and I began to be afraid would not hold out the long period. I thought it possible a change might be going to take place in the duties of incubation. But no relief was offered. The bird at large continued to walk about with the most stolid indifference. The one on the nest

settled again, only coming off for refreshment twice a day instead of twice a week.

“Everything went on prosperously till the seventh week had expired. My family were absent at our place of worship. On coming home, immediately on entering the premises and catching sight of the bird at large, with that instinctive perception we cannot always trace to any particular cause, I saw that something was wrong. I hastened to the nest, and found it deserted! The bird that ought to have been there was wandering about in a state of irritation and excitement, and had evidently been disturbed. All my hopes of young emus suddenly sank down to zero. I did everything I could devise to entice the bird back again to the nest, but it was all of no avail. When, from further observation, I was convinced it was a case of hopeless disturbance from some unknown cause, I reported the state of affairs indoors, where the disappointment was fully equal to mine, and sat down to think.

“It was really touching to see that fine nest of eggs—not an everyday production in this country, and so near completion of their period for bursting into fresh life—exposed to the cold world without protection! The first thing I did was to take out a bucket of moderately warm water, into which the eggs were all plunged, to arrest their further chilling, in case of there being any life in them. My wife then improvised a sand-bath, by means of a large saucepan or fish-kettle, which was placed over the boiler by the side of the kitchen fire.

“Into this the most likely eggs were transferred, and carefully covered with flannel. In the meantime she had performed the old farmhouse experiment of immersing them individually in hot water, and pronounced that

there was actual life in at least five of them. This encouraged us to persevere. I had previously ascertained, for the sake of information, the heat of an ordinary sitting hen, and found it to be about 93° – 94° . I allowed 10° more, as probable for those large semi-tropical birds. I got my sand-bath therefore up to 104° , and endeavoured to keep it within the range of 100° to 108° . I wrote off to the Zoological Gardens, stating my misfortune, hardly supposing, but asking if anything could be done, and begging, if so, they would let me know by telegram; and I sat up with the sand-bath nearly all night, regulating the temperature, and occasionally turning the eggs.

“The next afternoon—delayed from our post address not happening to coincide with our nearest railroad station—I received the following telegraphic message:—*‘Send up the eggs; we have a bird that will hatch them.’* The effect was almost electrical. Though how—what bird, what hopes, what certainty—was all a mystery; we had nothing to do but gratefully and implicitly to obey in faith, to the best of our ability. It was then just too late to catch our last train, with time to return the same evening; and having mastered the regulation of the temperature, and feeling confident there was no further injury being sustained, I did not think it well to run the risk of hurry, but took another night at watching and regulating.

“The next morning a quantity of bran was made hot, the eggs carefully packed with it in a tin case, the whole rapidly enveloped in many folds of flannel, and despatched per first train by the hand of a careful messenger, with instructions to use every reasonable celerity. He arrived at the gardens with them quite safely, and

found the superintendent ready to receive them; they were taken out still quite warm, and immediately placed under an emu, which for the last fortnight had wanted to sit, without any eggs!

"The reward of this care and perseverance against such a multitude of chances, and the really extraordinary part of the business, is, that in the course of the following week four young emus were hatched out, to the no small interest and gratification of all concerned, and no doubt to the astonishment of the bird, which had sat for such an abnormally short time for the living result. The brood formed one of the advertised attractions of the gardens during the early part of last season. One of them lived only about six weeks; another, which grew up with a defective spine, died in the winter; the other two still grace the gardens, having arrived at nearly full emu's estate. There was also a fine chick in an egg that had received a crack, and two or three other immature ones that did not come to the birth. The eggs in the incubator did not hatch.

"My poor emu, which had sat so long, and was thus deprived of the natural reward, was very emaciated and out of spirits for some time. On close scrutiny, a day or two after, I found emus' footmarks along several beds in the garden, and tracked one pretty evidently forced between bushes, where it would not voluntarily have gone, as if driven. I learned subsequently that they were seen that morning out of their boundaries. My interpretation is, that knowing of the absence of the family, some stranger entered the premises, which are easily accessible, with or without evil intention, perhaps from curiosity, perhaps in ignorance of the bird and its critical condition, possibly with dog and gun for the

purpose of shooting, or with rod and line for fishing, and unwittingly disturbed it—a strange dog would lead to a fearful commotion—had left the gate of the enclosure open, carelessly or in alarm, through which the emus had rushed, had got them back again somehow, and effected his escape, uncognisant, it might be, of the whole mischief.

“During the summer my birds improved, both in plumage and condition, upon the previous season. From all I could observe, I still believed the smaller one to be the female, the larger the male. On the 29th of December I went down, as was often my custom, about four o’clock in the afternoon, to see after their welfare. I was alarmed at finding the larger bird with symptoms of being very unwell. It hissed at me, and strained with its neck violently, as if choking, and I thought it must have got something in its throat. I was going immediately for assistance, when I bethought me I would try and get it into its house first; and for this purpose attempted to drive it, when it gave another great retch, and—*an egg dropped upon the ground!* The illness was all over. This bird quietly walked off with the most perfect indifference, and at the same moment down rushed the other one, in a state of the greatest excitement, rolled the egg—fortunately unbroken by the fall—over and over till pleased with its location, and finally covered it with leaves, thus definitively settling the question of sexes, the extraordinary *reversal* of habits and manners by which we had been misled, and the crowning fact of the *male* bird doing all the sitting, and, as I had afterwards the opportunity of witnessing, of bringing up the young ones entirely.

“It was nearly six weeks earlier than the previous season for the laying to commence. In preparation,

however, for the occurrence, I had a much more suitable house built, better protected from casualties, open still in front—in order not to give the air of confinement to those freedom-loving birds—and hung inside with branches of the evergreen conifers, to present somewhat of a natural and homeish appearance. The next egg followed on the fourth day after the first one, namely, on the second day of the New-year; the third on the fifth day after that; and then there was an addition every third day, with perfect regularity, up to the thirteenth, which again took four days, and the fourteenth six days. There was no difficulty in inducing the laying bird to take to the new house. The same precautions were adopted as last season in removing the eggs as deposited during the severe weather, and replacing them by artificial ones. Precisely at the same relative period as before—namely, after the laying of the thirteenth egg, the other bird—whom we may now unhesitatingly designate by his proper pronoun *he*—became increasingly busy about the eggs, and began to show symptoms of making the same kind of rude nest in the hollow provided, and finally settling on St. Valentine's Day, the 14th of February 1862. The eggs, as last year, had almost regularly increased in size and weight, from 1 lb. 2½ oz. to 1 lb. 7 oz., the average being considerably above the previous season. It was thought best to keep back the four first, as the smallest and least to be depended upon, and *he* was therefore set upon ten eggs, being perhaps as many as was prudent.

“The next day I was favoured with a visit from Mr. A. D. Bartlett, the prompt and energetic superintendent of the Zoological Gardens, who had been duly informed from time to time of the progress of events.

He was pleased to approve of the arrangements entirely, but thought the bird would cover the whole number of eggs, and that therefore the four which had been kept back — and which I wished him to take to experiment upon, but he declined, as they had no bird then likely to adopt them, and he had no faith in the incubator—might be safely added to the nest. I divided the matter, giving the bird two more, quite sufficient, as it afterwards proved, and attempted to hatch the other two by means of an *impromptu* incubator, which I need scarcely say failed entirely.

“We made several experiments to ascertain the heat generated by the bird, with a very susceptible Nigretti and Zambra’s thermometer he had brought for the purpose ; but probably from not giving time enough, or the normal heat not being yet developed, did not obtain up to quite 90° while the superintendent was here. I pursued the experiments afterwards with one of Casella’s pretty little instruments, made for the purpose ; but the last time it was put under the bird for the night I was unable to find it again in the morning without more disturbance than I liked to risk with so large an area of search. When discovered, which was not till the sitting was over, it was unfortunately broken. The highest temperature I actually observed was 96° . A large Dorking hen, with the same instrument, registered 103° as the maximum, average 98° .

“Last season I noted that three more eggs were laid into the nest after the bird was settled. This year we had the opportunity of seeing the female bird deliberately walk up to the nest, and therein deposit another egg, without materially disturbing the sitting bird, who immediately took proper charge of it. The process did

not take above one minute, so that it required to be in luck's way to have the opportunity of witnessing it. This must have been repeated four times, for the first time the bird was off long enough to enable me to get a good view of the nest, there were sixteen eggs in it! This, I believe, was too many. At times, during the long period of incubation, they were not all completely covered. The sitting was as assiduous as last year, but this season I adopted the plan of feeding the bird regularly on the nest, rather than he should famish himself as before. He took comparatively little, but the restless period at the end of four weeks did not supervene.

"In the fifth week I found one of the eggs broken in the nest, with an embryo chick in process of formation. This was encouraging, independently of the loss. Exactly a fortnight afterwards the same thing occurred again. The progress towards chickenhood was very marked; the head, beak, and legs were perfectly formed, and the feathers over the body had made their appearance. I was somewhat uneasy at the cause of these accidents, when, a day or two afterwards, happening to catch the bird off the nest, I saw the one that was at large—the hen-bird—deliberately walk up, and, with a scolding air, endeavour, with her strong neck acting as a lever, to force her faithful partner down upon the nest again. In this attempt of course a struggle ensued, and thus it was, no doubt, the fractures had occurred. Not being disposed to run any further risk from the same cause, I shut the hen-bird off from that time.

"Eight weeks were completed without further accident. We were on the tiptoe of daily expectation. Nine weeks elapsed without result. We all began to look serious. Two days more expired fruitlessly, and I

believe all but myself had quite given up all hopes. The bird still continued to sit unweariedly, and I thought of the last four eggs laid into the nest, the normal time for all of which could not have yet been exhausted. Judge of the reaction when, on visiting the nest in a half melancholy, desponding mood, the first thing on the morning of Easter Sunday, the 20th of April, I descried an evident cast-out shell, and, on looking more closely, the striped body of a young emu protruding from under—not the wing, for it has none—but the fostering side of its parent! I hardly knew how to break the tidings indoors. The next day produced another; and two days more a third broke its way out of the shell. The bird continued to sit to the end of the week. Two dead chicks were found in two other eggs; the rest proved addled.

“The eldest young emu was weakly from the first. A pellicle of skin continued drawn over one eye for several days, and I am not sure it ever obtained its full sight. It died in the fifth week. The other two are in high health, and thriving. They are now towards eight months old, have lost their infantile striped plumage, are apparently about half-grown, and very saucy, and are beginning to think themselves veritable emus. I must not omit one remarkable set of phenomena that now became developed. For the first month the young ones were very tenderly watched and guarded within their house, the father being most assiduous, gentle, and attentive in their nurturing. Having somewhat established themselves in the world, they were given a little more liberty. The first time the mother-bird caught sight of the little ones she became much excited, seized one of them by the head, and threw it a regular

sommersault up into the air. A scuffle ensued between the big birds, by which I became alarmed for the safety of the young ones, and was obliged to interfere. At first I thought it might be only jealousy or natural excitement that would soon subside, or an odd and antipodean way of showing pleasure; but, with further experience, became convinced it meant mischief on the part of the mother-bird.¹ They were, therefore, continued to be kept separated, but only by a wire fence, in order that they might be so far in company, and become familiarised.

“The time arrived when we thought the parent birds at least ought again to associate, and would no doubt be glad of each other’s society. They were introduced accordingly by the removal of a portion of the fence, when the female bird rushed upon the male, and drove him round and round, endeavouring to strike him with her strong foot forward, whenever she could get him into a corner, till I was obliged at last to separate them again. The loss of feathers, if not of blood, was considerable. Here was an unexpected dilemma, beyond the jurisdiction of Sir Cresswell. The experiment was repeated several times, with the same result, until, in fact, the persecuted ‘weaker vessel’ was driven by a fierce charge to leap the fence, in doing which he tore a long wound in his neck, and might have been seriously injured. This evidenced real hostility on the one part, and fear on the other. Thinking the presence of the young ones might possibly be the cause of offence, and deeming they were now able to shift for themselves, I

¹ A similar thing was observed by Mr. Tegetmeier in the case of the common emu and young at Clumber. See “The Field,” 12th September 1868.

determined to wean them, and, as a preparatory step, removed them and their father to another enclosure, as much out of sight and hearing as could be arranged. They were some time in getting settled in their new habitat, especially the little ones, who appear to have the organ of locality very largely developed. In introducing the male bird again to his companion, it was necessary to take the young ones as well, as they would not be parted. Precisely the same scene recurred as at first—namely, a violent charge, by which the male was overpowered by the female, and obliged to run; but after a little while the former gained courage, beat off the latter, and completely turned the tables, the young ones joining heartily in the chase with either party. This was repeated day after day, without any progress towards a settlement of the domestic difficulty, and to the extent of the heavier bulk of the hen-bird becoming distressed by exhaustion, and she showed symptoms of being sorely frightened whenever she saw the approach of her lawful mate. I now separated the young ones entirely, and shut the male bird up, to reduce his spirit in turn. This had the desired effect. On being let out together, after three days' confinement, *she* was again master. They were now transferred into a field, where there was plenty of room for them to run, without danger of doing much mischief to each other. Here the more agile and lithesome male readily escaped from his persecutor, and she had to give it up for a while, until sufficiently recovered to renew the chase, with the same result. They are getting weary, after a fortnight, with this sort of daily occupation, and are gradually becoming more reconciled to each other's presence. I expect very shortly the male bird will turn again, assert

his natural equality at least, and that they will make it up for another season.

"The final parting of the young ones with their father was very hard work. The poor little things, as soon as they found themselves alone, set up the most plaintive cries, lasting all through the night and the following day or two, and beat themselves about, until one had made its head and neck quite sore, against the sides of the enclosure—incessantly haunting that side towards where their paternal guardian, friend, and playmate had been taken. He appeared to forget them in about a week. They still commence every morning with their plaintive cry of distress, though now the third week since their separation."

Mr. Bennett continued his experiments, and the following year reported as follows¹ :—

"I left my young emus (Zool. 8323) just parted from their affectionate father, and not yet fully reconciled to beginning the world on their own account. The sense of deprivation gradually wore off, and occasionally they were indulged with an interchange of visits, in order to keep up acquaintanceship and mutual interest. During the winter they had each a severe illness, one following the other. My friend John Steele, one of our ablest medical practitioners of Reigate, and a warm naturalist, hearing of their indisposition, called professionally. On examination of the symptoms, apprehending it was the liver that was affected, probably by the difference of our climate, he prescribed one-grain calomel pills, to be given every third day, followed by a gentle aperient. They were very difficult patients to administer any-

¹ "The Zoologist," 1864.

thing to. Somehow, however, this was managed for a fortnight, and they both recovered, after one had been entirely given over. They are now grown fine birds, nearly as tall as their parents, but not, I think, mature for another season at least. The two are very different in their bearing and manners, one being much higher spirited and less tractable than the other; but both have for some months began to put on the *boom*, the peculiar indication of the female bird, though one is much more distinctly pronounced than the other, and it is exceedingly different to determine the sexes until quite mature. They likewise had a severe quarrel, lasting for nearly a month, in the spring, which looks like jealousy, but perhaps it was only to establish supremacy, for they are now entirely at peace. The two from the same stock of the preceding season, in the Zoological Gardens, Regent's Park, have thriven well, are now considered to have arrived at maturity, and are pronounced both males. My adult birds became reconciled to each other in due course.

“The next season (1863) was most prolific in eggs, but proved an entire failure as to any further result. The laying commenced on the 2d of January. There was an interval of four days between each of the three following eggs, and then the process continued with the utmost regularity, on every third day, even to the time of the afternoon. It was invariably within a margin of one hour on either side of four o'clock that an egg was deposited, up to the twentieth in number (see ‘Diary,’ Zool. 8494). I had learned to interpret the voice of the bird, namely, a low muttering sound she regularly makes for an hour or so before laying, which rendered the observation of the time a matter of but little diffi-

culty, whenever I was at home. The same precautions were taken with respect to the safety of the eggs from frost as the previous season. After the number of eggs had been laid, the male bird exhibited the usual symptoms, and he was set upon thirteen eggs on the 5th of March.

The early period of sitting was as close as before. The first view obtained of the contents of the nest was on the 9th, when two more eggs were found to have been added. The bird at large was seen to deposit another on the 12th. It was on the 21st before another view of the nest was obtained. There were then seventeen eggs in it. Three were removed, under the idea that there would be still as many as the bird could do justice to. An incubator was started for the reception of the surplus eggs.

“The bird at large continued to lay until the enormous number of twenty-eight was completed. From the average known weight of the bulk of them, it must have amounted to about 40 lbs. in all.

“The management of the incubator was conducted exactly as recommended at the Zoological Gardens, as nearly as circumstances admitted, except that the average temperature aimed at being maintained was 104° instead of 108°. All my subsequent observations lead me to conclude that the former may be somewhat too high. During the first four weeks everything went on admirably. In the fifth week I was summoned from home by the illness of a near relative. Though only absent a day or two, a source of disturbance occurred which I did not know of till afterwards. Nothing amiss with the sitting bird was detected on my return. Early on the afternoon of the following day, however, I found

the bird off the nest, and wandering about, to my great dismay, in a state of the utmost excitement. Nothing could reconcile him, or attract him back again to the nest. After some inquiry, I learned that a pleasure-boat had just gone up the river (a privilege we by no means wish to deny our neighbours up or down our sullen, but attractive and sylvan little stream), and that previously in the week another, or the same boat, had landed some of the party, to notice the birds during my absence from home. The sight of strangers, especially ladies in black, or with flying gay ribbons, or loud voices, or unaccustomed noises of any kind, always greatly disturbs and excites them. But it was the plash and sound of the sculls in rowing, that I believe was the great cause of offence. I have since noticed that the beating of a carpet or a drum, anywhere within hearing in the neighbourhood, greatly distresses them; and I have now no doubt that it was a boat coming up the river that Sunday morning that was the unknown and mysterious cause of disturbance on the first occasion. I had ample evidence that the sight or sound of a boat is something of which these birds have a remarkable dread or antipathy to, when, on going my round two or three days afterwards, I again found the two young emus, then a year old, in a state of the greatest anger and alarm, with flaming eyes and mouths open, one of them having leaped the fence in its terror. On looking round for the cause, *there was the boat*, having just landed opposite their enclosure—come to make an apology—the lady and gentlemen having heard of the unfortunate disturbance! My poor sitting emu—that was! Everything I could think of to quiet and console him, and attract him back again to the nest, was

persevered in till hopeless. All the more likely eggs were then removed to the incubator. As I anticipated, the bird sat again that night, and the bulk of the eggs were restored. I clung to the hope that he would forgive and forget the offence, and resume the sitting, though, from certain symptoms observed, I was not very sanguine. My first visit in the morning satisfied me it was all over. The bird was off the nest, and chafing violently against the railed door of the house, which had been shut that night for safety. The eggs were returned to the incubator.

“No accident that need have been fatal to the successful hatching out of at least some of the eggs happened, as far as I am aware of, to the incubator. Some ordinary chickens were hatched in it during the process. But two months is a long time to keep up the normal conditions; and many little delicate handlings of Nature repeatedly wanting, may tell. Various eggs, one after another, gave undoubted signs of being addled, and were removed; and all, but not till after they were much overdue, were eventually given up. I tried to console myself with the thought that perhaps the whole batch this season might be barren eggs, and thus afford a possible reason why the bird was the more readily disturbed. Experience has since shown that the reason would have failed had the fact proved so. All my disappointment and mortification returned in full, when, on preparing the eggs for specimens, by emptying the contents, I found, altogether, a large number of embryo chicks, in various stages of development—several with beak, claws, and plumage complete—apparently just ready to break through the shell! The process must, therefore, have gone on properly in the incubator, very

nearly to maturity ; but I very much doubt, from subsequent experience, whether any of these, if healthily hatched, could have had strength to have been healthily reared.

“ I think I may say my adult birds continue to improve in manners and plumage every year, so far. The first egg this season was dropped on the 23d of December 1863, as usual, in the first place, down by the water-side. Another was not found till nine days afterwards, namely, on New Year’s Day, and the third not till the 12th of the month. One, however, was subsequently found, down by the water, in a dirty condition, that had evidently been long laid, which probably intervened, and possibly more than one may have been lost. The two next eggs occupied four days each, and then the laying proceeded every third day, with the accustomed regularity, and the observance of the average time of four o’clock in the afternoon. The total number laid this season does not nearly reach to last ; but they have annually increased in size, several this year weighing over $1\frac{1}{2}$ lb. It is very curious the bird, in sitting, kept the precise anniversary of the year before last, namely, St. Valentine’s Day, the 14th of February. The number of eggs he was settled upon, in the first place, was ten. Extra precautions had this year been taken to shut out any unusual sight or sound, and promote perfect quiet, by the erection of a double screen of evergreens before the house, and a bar was respectfully placed on the proprietors of boats, not to pass beyond a certain point for the necessary period.

“ The bird sat, if possible, more closely than usual ; so much so, that a sight was not obtained of the nest till the expiration of the fourth week. It was then

found to contain fifteen eggs, so that five had during the time been laid into it. As heretofore, the bird, after this period, became much more restless. The eggs had been marked on previous occasions, so as to endeavour to learn their individual history, but the markings had not proved permanent. This year a pigment of copal varnish and vermilion was employed, and each egg, as laid, conspicuously numbered in two places, which proved effective. In the sixth week the last laid egg was found turned out of the nest; and, as they had not always been well covered, it was not replaced. Early in the seventh week an experiment was tried on one of the eggs, in the usual way, with hot water, and it showed manifest signs of life; and the hen-bird was now shut off for fear of disturbance. On the 6th of April an egg was found laid just outside the house, because she could not get in! The closing day of the eighth week the sitting bird was most uncomfortably restless throughout, and gave me much anxiety about the result, but settled again towards night. The first thing next morning, I found an egg turned right out, and being a slope, had rolled a considerable distance. It was stone-cold. I brought it in, however, and thought we would just try it with hot water. To our wonder and admiration it kicked—that is, the chick within it—most vigorously! Of course it was instantly replaced under the bird. The following morning *the same egg* was again found rolled out of the nest, but not to so great a distance, and it had not become so cold. What could this mean? It was again treated with hot water, and not only manifestly moved with increased strength, but a distinct *chirp* was heard inside! Again on the next morning three more eggs, all differing in their number

to the previous one, were turned out and exposed; so it was not any particular antipathy to that unfortunate egg. They were all tried, and showed ample signs of life, and upon being placed close to the ear, a strong internal movement, like fermentation, was distinctly perceptible. They were all immediately replaced. On the next morning, April 13th, the first young emu was hatched out, to our great delight: it was No. 13, the identical egg that had been twice dislodged from the nest, and once was taken up so deathlike cold! On the 14th, Nos. 12 and 10 hatched out, and on the 15th, Nos. 5, 11, and 7. On the morning of the 16th a death was found to have occurred in the night. It was not one of the last three, and there was no apparent cause. I am strongly inclined to suspect it was poor unfortunate No. 13, a large, strong chick to all appearances, but perhaps died from inflammation or a cold caught in the egg from that night's exposure. It was replaced, however, by No. 8 being hatched in the course of the day.

"The day following was a day of rest. The next morning produced another, an unnumbered egg, being the first, no doubt, of the additional ones laid into the nest. The three remaining of the original numbered eggs were now tried, found to be lifeless, and removed.

"There were still three left of the additional more recently laid eggs, which would each require the corresponding multiple of at least three days for the normal time of hatching. Two of these exhibited unmistakable signs of life, and one distinctly chirped.

"The bird, with his large family about him, was now naturally very much off the nest by day. The two

living eggs were therefore brought away, and exposed to the full sun (ranging from 100° to 118°), whenever it served, or kept by the fire at something over 100° , and put under the bird at night. The more forward of the above two was safely hatched on the 22d. The other one progressed in strength daily; was heard to chirp four days beforehand, but did not begin to break out of the shell till the 28th. It was nineteen hours in completely extricating itself, and that not without some assistance from its parent, and even from its active elder brothers and sisters, to the eminent peril, apparently, of its poor little life. It was not healthily hatched, though it grew and gained in strength for several days. It had one foot cramped from the first, and being once fed (forced with food), never took anything of its own accord. Over-heating is almost an invariable cause of weakness and cramp, and I think it had probably too much before the fire. It had to be nursed almost entirely indoors, and during its short life became evidently much attached to those about it. Though it could only hobble at best, it would follow me when doing little matters in the sunshine about the garden, and would utter the familiar plaintive cry when I was long out of sight. It was always put back to its parent at night, and was found crushed in the nest on the morning of the 8th, aged ten days. The remaining egg was finally abandoned. Thus a brood of ten young emus has been hatched this season altogether. One other misfortune I have to record. On returning home late from a necessary day's absence, and proceeding at once, as usual, to the emu-house, I found one fine strong little one, the second in age, I believe, stretched lifeless on the ground, from an accident, I apprehend, that

further experience may avoid. The remaining seven are thriving well, grow fast, all but one appear quite healthy, and they form a most lively and interesting family. A trying period comes on at about four months of age.

"It was found necessary to separate the mother bird as before, on the young ones being let out. The parents spar occasionally across the fence when anything occurs to excite them. *He* is most gentle and attentive to the little ones, and steps about amongst them with the most admirable care. Let, however, a strange dog or cat, or other supposed enemy, make its appearance, and the scene is absolutely sublime. *She* is in full sight of them, and struts about with a full pouting breast of feathers, and evident satisfaction, like a great turkey-cock. The young ones, instead of the ashy brown adult plumage, are elegantly longitudinally striped, their heads very prettily dappled; they are anything but shy, feeding freely out of the hand, and are very playful, imitating all the odd actions of the parent birds.

"I draw the following conclusions, in addition to or in correction of former observations, as to the habits of these singular birds:—

"1. The normal period of incubation is about sixty days.

"2. The number hatched in the natural state is probably very small, though the number of eggs is so large. The eggs are probably laid about, with an affection for sheltered damp places, and when the breeding comes, the male bird gathers together the few he can find, sits upon them steadily for a month, becomes restless as soon as he feels life in them, perhaps very much exposes them to the sun for the last fortnight, and when

two or three are hatched, walks off with them away from the mother bird, leaving the rest to perish.

"3. The principle of life is remarkably strong in the young bird, both while an embryo in the egg and afterwards."

It appears that the number of eggs laid by each hen, and deposited every third day, is very variable, ranging from seven or eight to eighteen; but it is said that, to ensure a brood, a bird ought not to be allowed to sit on more than eight or nine.¹ The chief difficulty to be encountered is the weather, which, at the early period of the year when these birds lay (*i.e.*, January and February), is often very inclement. Due precautions therefore should be taken to provide shelter and warmth, without at the same time interfering with the birds' liberty.

¹ Le Prestre, Bull. Soc. Imp. Acclim. 1870; p. 109. See also Touchard, *op. cit.*, 1867, p. 6.

CHAPTER XVI.

THE APTERYX OR KIWI.

The apteryx or kiwi of New Zealand—Anatomical characters of the *apterygidae*—Four species recognised—Their synonymy and distribution—General account of their haunts and habits—Reproduction—Eggs—Breeding in confinement.

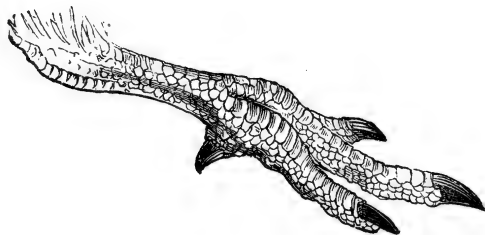
No account of the struthious or ostrich-like birds would be complete without some allusion, however slight, to that remarkable wingless form which inhabits New Zealand, and is there called by the natives "Kiwi," while to scientific naturalists it is known as the apteryx.

Four species are stated to exist, and to be exclusively confined to New Zealand, but being incapable of flight, and hunted down upon every opportunity, it is evident that, like other wingless birds which have preceded them, they must ere long succumb to their numerous enemies, and eventually become classed amongst the forms which are extinct.

A complete account of these singular birds, which even to the present day form the most distinctive feature in the avifauna of the country which they inhabit, would not only occupy more space than could be here accorded to the subject, but is rendered more or less unnecessary from the fact that the labours of others have already placed on record, in a connected form, to which we shall presently refer, all that has hitherto been ascertained regarding them.

We shall, therefore, do no more than offer some general observations on the distinguishing characters of the *Apterygidæ*, with a few remarks on the habits of the better known species.

Although, as in the ostrich, the head is small, and the neck large and muscular, the bill is long, broad at the base, and tapers in a curve to the extremity, which is slightly dilated. The wings, which are rudimentary, are quite concealed by the dorsal plumage, the feathers of which are lanceolate, and composed externally of long disunited filaments, the downy portion towards the root much developed, and exceeding in extent the exposed



Foot of Apteryx.

or hairy portion. They are destitute, moreover, of the accessory plumule so highly developed in some of the struthious birds, but the basal or concealed portion of each feather is fine and silky.¹ The thighs are prominent and very muscular; the feet robust, and armed with sharp claws, while a hind-toe, which is not present in any of the *Struthionidæ*, is in the *Apterygidæ* prominently developed. In old birds the scales which cover

¹ The difference of structure in the feathers of the *Apterygidæ* and *Struthionidæ* may be seen at a glance on referring to Mr. Dawson Rowley's plate of feathers, which illustrates his remarks on this subject in his "Ornithological Miscellany," part I.

the tarsi and toes are closely set, with overlapping edges, and are perfectly smooth; in the young they are soft and detached, presenting a reticulated surface.

A well-known observer in New Zealand, Mr. T. H. Potts, has remarked,¹ that after looking over numbers



Skeleton of Apteryx.

of all the known species of apteryx, he has arrived at the conclusion that no specific character can be safely drawn from the skin of the tarsus being scutellate or reticulate.

Their osteology and anatomy have been exhaustively treated by Professor Owen in several able memoirs contributed to the "Transactions" of the Zoological Society;

¹ "The Ibis," 1872, p. 36.

and as regards their life history, Mr. Buller's recently published work, "The Birds of New Zealand," and Mr. Dawson Rowley's essays in the "Ornithological Miscellany," contain almost all that is known of their haunts and habits.

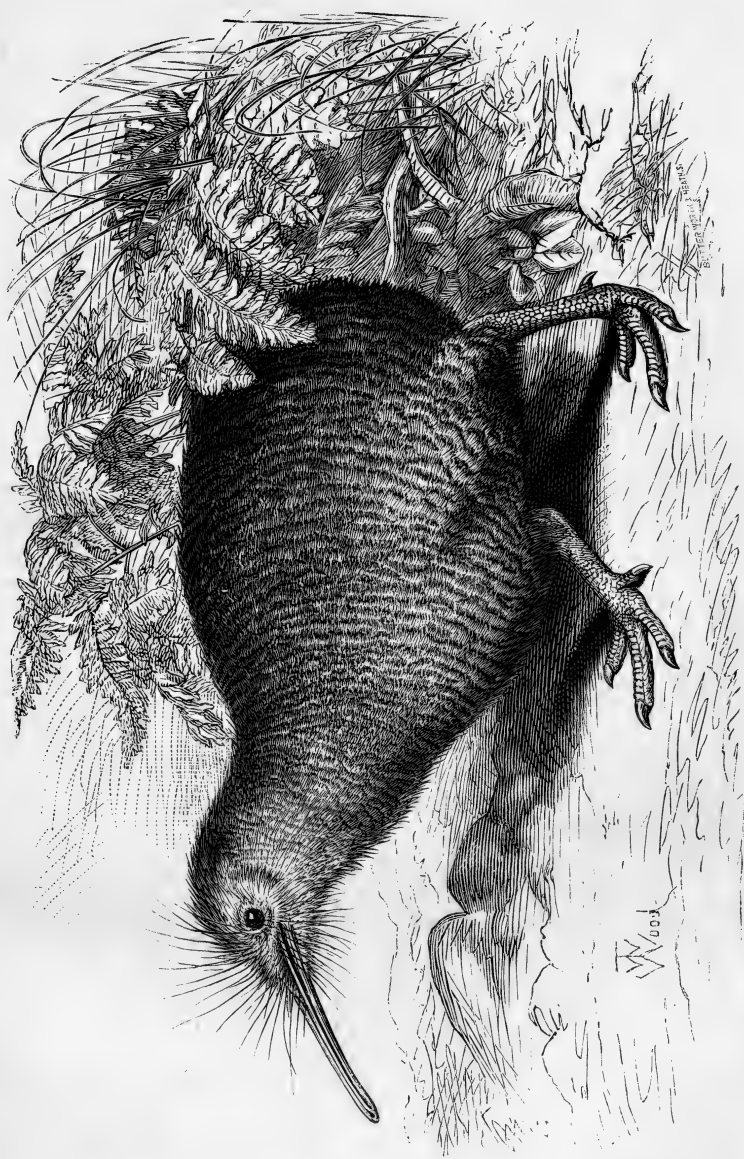
Although possessing certain characters which connect them obviously with the *Struthionidæ* or ostrich family, the *Apterygidæ* are, after all, but distantly related to these birds; and, as Professor Nathusius has pointed out, the structure of the egg-shell in *Apteryx* does not much agree with other *Struthionies*.¹

The four species above referred to are :—

1. THE NORTH ISLAND KIWI, *Apteryx mantelli*, Bartlett, Proc. Zool. Soc., 1850, p. 275 = *A. australis*, Gould, Birds Austr., vol. vi. pl. 2 (1848), nec Shaw. *A. australis*, Scater, Proc. Zool. Soc., 1871, p. 496. *A. mantelli*, Buller, "Birds of New Zealand," fig. (1873).
2. THE SOUTH ISLAND KIWI, *Apteryx australis*, Shaw, Nat. Miscel., vol. xxiv. pls. 1057, 1058 (1813) = *Dromiceius novæ-zelandiæ*, Lesson, Man. d'Orn. vol. ii. p. 210 (1828). *A. australis*, Dawson Rowley, Orn. Miscel., part i. fig. juv. (1875).
3. THE LITTLE GREY KIWI, *Apteryx oweni*, Gould, Proc. Zool. Soc., 1847, p. 94. Buller, "Birds of New Zealand," fig. (1873). Dawson Rowley, Orn. Miscel., fig. ad. and juv. (1875). Distributed over a great portion of the South Island, to which it is restricted.
4. THE LARGE GREY KIWI, *Apteryx haasti*, Potts, Trans. N. Z. Instit., 1871, p. 204; and 1872, p. 195 = *A. maxima*, Hutton, Cat. Birds N. Z., 1871, p. 23; nec Bonap. Dawson Rowley, Orn. Miscel., fig. ad. and juv. The few specimens at present known to exist were procured on the west coast of the South Island, on the high ranges above Okarita.

In a recent discussion on the subject before the Wellington Philosophical Society, New Zealand, Mr. Buller contended for the specific value of *Apteryx mantelli* of the North Island, on the ground that it is

¹ Nathusius, Zeitschr. Wissensch. Zool., xx. p. 128.



OWEN'S APTERYX, *Apterix Oweni*.



readily distinguishable from the other bird, and that the variation is constant; while Professor Kirk agreed with Dr. Finsch, who proposes to call it *Apteryx australis*, variety *mantelli*, considering that the bird discovered in the North Island is merely a variety of the species in the South (*Apteryx australis*), the slight difference between them being insufficient to warrant their separation.

With the life history of these birds we are as yet imperfectly acquainted. The North Island kiwi is perhaps the best known, and of the habits of this species, so far as have been ascertained, Mr. Buller has given the following account in his "Birds of New Zealand":—

"The kiwi is in some measure compensated for the absence of wings by its swiftness of foot. When running, it makes wide strides and carries the body in an oblique position, with the neck stretched to its full extent and inclined forwards. In the twilight it moves about cautiously and as noiselessly as a rat, to which, indeed, at this time, it bears some outward resemblance. In a quiescent posture, the body generally assumes a perfectly rotund appearance; and it sometimes, but only rarely, supports itself by resting the point of its bill on the ground. It often yawns when disturbed in the daytime, gaping its mandibles in a very grotesque manner. When provoked, it erects the body, and raising the foot to the breast, strikes downwards with considerable force and rapidity, thus using its sharp and powerful claws as weapons of defence. The story of its striking the ground with its feet to bring the earthworms to the surface, which appears to have gained currency among naturalists, is as fanciful

as the statement of a well-known author that it is capable of 'inflicting a dangerous blow, sometimes even killing a dog!'

"While hunting for its food the bird makes a continual sniffing sound through the nostrils, which are placed at the extremity of the upper mandible. Whether it is guided as much by touch as by smell I cannot safely say; but it appears to me that both senses are called into action. That the sense of touch is highly developed seems quite certain, because the bird, although it may not be actually sniffing, will always first touch an object with the point of its bill, whether in the act of feeding or of surveying the ground; and when shut up in a cage or confined in a room, it may be heard all through the night tapping softly at the walls. The sniffing sound to which I have referred is heard only when the kiwi is in the act of feeding or hunting for food; but I have sometimes observed the bird touching the ground close to or immediately round a worm which it had dropped without being able to find it. I have remarked, moreover, that the kiwi will pick up a worm or a piece of meat as readily from the bottom of a vessel filled with water as from the ground, never seizing it, however, till it has first touched it with its bill in the manner described. It is probable that, in addition to a highly developed olfactory power, there is a delicate nervous sensitiveness in the terminal enlargement of the upper mandible. It is interesting to watch the bird, in a state of freedom, foraging for worms, which constitute its principal food: it moves about with a slow action of the body, and the long flexible bill is driven into the soft ground, generally home to the very root, and is either immediately withdrawn with a worm held at the

extreme tip of the mandibles, or it is gently moved to and fro by an action of the head and neck, the body of the bird being perfectly steady. It is amusing to observe the extreme care and deliberation with which the bird draws the worm from its hiding-place, coaxing it out as it were by degrees, instead of pulling roughly or breaking it. On getting the worm fairly out of the ground, it throws up its head with a jerk, and swallows it whole.

“The stomach of a recently killed wild bird which I dissected contained a hinau-berry (*Elæocarpus dentatus*) and rounded fragments of white quartz. Dr. Day writes me—‘In its very muscular stomach I have usually found the remains of beetles, pebbles, and many hard kernels of the hinau-berry.’”

The Zoological Society of London has procured alive, at different times, three out of the four species of this singular genus, namely, *Apteryx mantelli* (*australis* of Sclater); *Apteryx oweni*, presented in 1869 by the Acclimatisation Society of Otago, as the first which had been brought alive to Europe; and *Apteryx haasti*, a specimen of which was presented to the Society in December 1875 by Baron F. von Mueller.

In 1859, an individual of the first-named species laid an egg in the Society's Gardens. It was smooth and of a dirty white colour—the form an elongated oval, slightly tapering towards the smaller end, 4·75 inches in long, and 2·9 inches in short diameter. It weighed 14½ ounces, or nearly one-fourth of the weight of the bird itself, which was found by experiment to weigh 60 ounces.

In Gould's “Handbook of the Birds of Australia,” vol. ii. p. 570, several statements are made with refer-

ence to the mode of reproduction of the apteryx, but as these strange stories are most of them derived from the natives of New Zealand, and do not appear to have been verified by any one upon whom one can place much reliance, it may be as well to record a few facts that have occurred under the observation of Mr. A. D. Bartlett in the Gardens of the Zoological Society. Mr. Bartlett says¹:—

“In 1851, Lieutenant-Governor Eyre presented to the Society an apteryx. This bird proved to be a female of *Apteryx mantelli*.

“In the year 1859 she laid her first eggs, and has continued to lay one or two eggs every year since that time. In 1865 a male bird was presented by Henry Slade, Esq.

“During last year (1867) these birds showed symptoms of a desire to pair. This was known by the loud calling of the male, which was answered by the female in a much lower and shorter note. They were particularly noisy during the night, but altogether silent in the daytime. On the 2d of January the first egg was laid, and for a day or more the female remained on the egg; but as soon as she quitted the nest, the male bird took to it, and remained constantly sitting.

“On the 7th of February the second egg was laid, the female leaving the nest as soon as the egg was deposited. The two birds now occupied the two opposite corners of the room in which they were kept, the male on the two eggs in the nest under the straw, the female concealed in her corner, also under a bundle of straw placed against the wall. During the time of incubation

¹ Proc. Zool. Soc., 1868, p. 329.

they ceased to call at night, in fact, were perfectly silent, and kept apart.

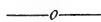
“I found the eggs in a hollow formed on the ground in the earth and straw, and placed lengthwise side by side. The male bird lay across them, his narrow body appearing not sufficiently broad to cover them in any other way; the ends of the eggs could be seen projecting from the side of the bird.

“The male continued to sit in the most persevering manner until the 25th of April, at which time he was much exhausted, and left the nest. On examining the eggs I found no trace of young birds.

“Notwithstanding the failure of reproducing the apteryx, I think sufficient has been witnessed to show that this bird's mode of reproduction does not differ essentially from that of the allied struthious birds, in all cases of which that have come under my observation, the male bird only sits.

“I have witnessed the breeding of the mooruk, the cassowary, the emu, and the rhea, and the mode of proceeding of the apteryx fully justifies me in believing the habits of this bird to be in no way materially different from those of its allies.”

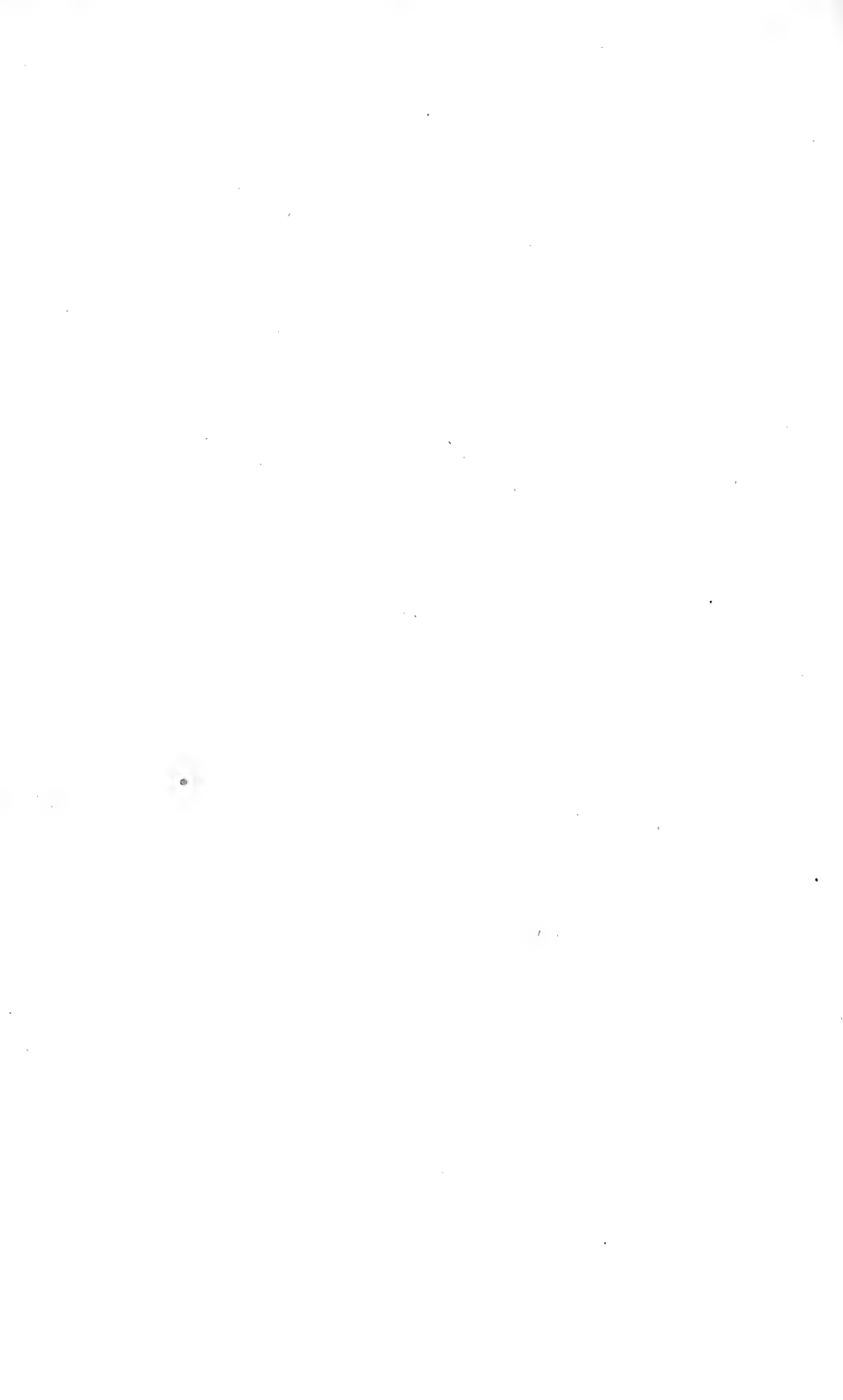
PART II.



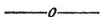
OSTRICH-FARMING.

BY

JULIUS DE MOSENTHAL.



PART II.



OSTRICH-FARMING.

Its history, development, and present condition—Domestication of the ostrich in Algeria, at Florence, Grenoble, and Madrid—In the Cape colony—Method adopted by the Cape farmers—First requirements for domestication—Best soils for ostrich-farms—Extent of run—Enclosures—Sheds—Food—Nesting and laying—Artificial incubators—Cost of birds—Value of feathers—Periodical cutting—Quantity and value of feathers exported from Cape Colony and Natal—Difference in feathers dependent on locality—Difference between feathers from wild and tame birds—Sorting and classification for the London public sales—Artificial bleaching—Countries adapted for ostrich-farming—Improvement of stock.

ALTHOUGH “ostrich-farming,” as at present systematically carried out in South Africa, is of comparatively recent date, the domestication of this bird for the sake of its feathers is not so great a novelty as many might suppose.

More than a century ago, the Swedish traveller, Dr. Sparrman, found that many farmers at the Cape had a number of tame ostriches on their farms, which were allowed to feed at large, and which supplied their owners with plumes which were made into brooms, and helped to drive away the mosquitoes.¹ Captain Lyon in his “Narrative of Travels in Northern Africa in the years 1818, 1819, and 1820,” states that at the towns of

¹ “Voyage to the Cape of Good Hope,” vol. ii. p. 127. This traveller visited the Cape in 1775.

Sokna, Hoon, and Wadou it was then the custom to keep tame ostriches in yards or enclosures, and in two years to take three cuttings of their feathers; and it has long been known that various tribes in Central Africa catch and keep ostriches for the sake of their plumes, which they barter with traders, and which find their way into Egypt with the caravans from Senaar.

But although the idea of ostrich-farming is not a new one, it is only within the last few years that the subject has come to engage serious attention. It became evident to reflecting minds that if buyers of ostrich plumes in Europe were to depend solely upon the receipt of such feathers as could be procured by hunting down and killing the birds in remote parts of Africa, their trade must soon altogether cease, since there would eventually be either no birds left to hunt, or they would be driven so far towards the wild and unknown interior as to render the pursuit of them attended with much risk and danger.

Accordingly, the Acclimatisation Society of Paris took the subject in hand, and in 1859, through the liberality of one of its members, M. Chagot, offered premiums for the successful domestication of the ostrich in Algeria or Senegal, and for breeding ostriches in Europe.¹ The first of such measures was to some extent successfully carried out in Algeria by M. Hardy, the Director of the Acclimatisation Gardens at Hamma, to whom the prize was accordingly awarded.²

About the same time Prince Demidoff commenced

¹ See Bull. Soc. Imp. Acclim., 1857, pp. 119, 180, 187, 243.

² An interesting account of M. Hardy's experiments in domesticating the ostrich in Algeria will be found detailed by himself in the *Bulletin de la Société Impériale d'Acclimatation*, 1857, p. 524, and 1868, p. 103. See also Rivière, tom. cit., p. 639, and 1870, p. 566.

experiments in breeding ostriches on his property at San Donato near Florence, which resulted in his rearing, for the first time in Europe, two young ones in 1859, and six the following year.

In 1860 the same female ostrich laid fourteen eggs, the first on May 11, and one every second day until the 31st. A twelfth was laid on June 3d, another on June 4th, and the last on June 5th. The female began to sit as soon as the first egg was laid, and sat for three hours daily, leaving the male to sit the rest of the time. The first young one made its appearance on June 23d, and was soon followed by three more, a fifth on the 24th, and a sixth on the 26th. The brood used regularly to pass the night under the parent's wing. There still remained eight eggs, but during a storm on the 26th the old bird became restless, quitted the nest, and would not return to it. Five of the eight eggs were found to be in a fair way of being hatched, but the other three were addled. The two young birds hatched in 1859 throve well and became full grown.¹

The example thus set was ere long followed in other parts of Europe, notably by M. Noel-Suguet at Marseilles,² and by M. Bouteille, the curator of the Natural History Museum at Grenoble, who in 1864 communicated to the Acclimatisation Society of Paris the result of his successful experiments.³ At Madrid, also, Señor Graells achieved a similar success.⁴ Thus it soon be-

¹ See Demidoff, *Bull. Soc. Imp. d'Acclim.*, 1860, pp. 1 and 439; "The Field," 4th February 1860 and 15th September 1860; and Desmeure, *Bull. Soc. Imp. d'Acclim.*, 1870, p. 205.

² Noel-Suguet, *Bull. Soc. Imp. d'Acclim.*, 1861, pp. 142, 382.

³ Bouteille, *op. cit.*, 1864, pp. 506-511, and 1867, p. 316.

⁴ Graells, *op. cit.*, 1861, p. 559; 1862, p. 91; and 1867, p. 477; and Ayala, *op. cit.*, 1862, p. 670.

came demonstrated that, under certain conditions easily attainable, there is no great difficulty in inducing ostriches to hatch their eggs in confinement, and rear their young.

In 1857, the Acclimatisation Society of Paris, through the intervention of M. le Maréchal Vaillant, obtained much valuable information from Algeria on the subject of the ostrich and its domestication. This information, embodied in three Reports drawn up by Dr. Gosse, will be found in the "*Bulletin de la Société Impériale d'Acclimatation*" for 1857,¹ to which periodical Dr. Gosse had already contributed an article, "*Des mœurs et des habitudes de l'Autruche*," which will well repay perusal.²

In the Cape Colony ostriches were kept in enclosures for the sake of their feathers, which were cut periodically, long before any means were devised or provision made for breeding them in confinement; and amongst those who early contrived to make a profit from the practice was the late M. Jules Verreaux, aide-naturaliste at the Jardin des Plantes, Paris, who for many years resided with his brother Edouard in South Africa, and, jointly with him, rendered much service to the cause of zoology by means of the valuable series of animals and birds which, at great expenditure of time and money, were there collected. The experience of these gentlemen on the subject of ostrich-farming has been detailed by Dr. Gosse in the article above quoted.

It would seem that the first instance of domesticated ostriches hatching their eggs in Cape Colony, so far as

¹ Tom. cit., pp. 331-343, 391-394, and 482-486.

² Ibid., pp. 21-37.

can be now ascertained, occurred in the Beaufort and Oudtshoorn districts about the year 1866.¹ Four years later young birds were successfully reared in the George district; and from that time to the present, the new industry of ostrich-farming has spread and thriven more or less throughout the colony.

In 1870, Mr. W. Kinnear of Beaufort West (as appears by a communication from him to "The Cape Argus," published in November of that year), had twenty-nine ostriches on eight acres of garden-ground. He considered that this extent of ground, being sown with lucerne and well watered, was capable of maintaining three times that number of birds throughout the year. For three pluckings of fifteen of them, at intervals of eight months, he received the sum of £240, which is at the rate of £120 a year, or £8 per bird. The other fourteen had not, at the date of his letter, attained their full plumage.

According to a census taken in 1865, there were in that year only eighty tame birds in the colony. Last year (1875) the census returns showed the existence of no less than 32,247. These were found to be distributed as follows:—Riversdale, in the west, 2892; Oudtshoorn, 2519; George, 1802; Calvinia, 1143; Willowmore, 1043; Cradock, 1045; Graaff-Reinet, 1032; Mossel Bay, 1015; Uitenhage, 976; Colesberg, 893; Swellendam, 820; Albany, 637; Fraserburg, 598; Paarl, 502; Beaufort West, 477; Murraysburg, 438; Worcester, 390; Clanwilliam, 358; Victoria West, 339; Middelburg, 338; Caledon, 310; Piquetburg, 230;

¹ See a letter from Mr. Dumbleton, of Oakhurst, George, Cape Colony, published in "The Field" of 12th December 1874. See also Heritte, Bull. Soc. Imp. Acclim., 1867, pp. 122 and 319.

Somerset East, 213; Stellenbosch, 205; Humansdorp, 196; Bedford, 169; Queenstown, 161; Knysna, 158; Robertson, 123. Smaller figures to each of the other districts, until the list is closed by Port Elizabeth, 10.¹

"The plans adopted by Cape farmers in meeting the first requirement of domestication, that of limitation of space, have been various. Mr. Kinnear at Beaufort made his enclosure, eight acres in extent, suffice for thirty birds. He was obliged to sow these eight acres with lucerne, in order to provide food for his birds. Other breeders have given their birds the run of their lands, trusting to careful herds, and the attractions of a daily feed of mealies at the homestead. Mr. White of Albany at one time gave an enclosure of five hundred acres to twenty-three young ostriches. Mr. Murray of Colesberg had about ninety within one thousand acres, walled round with stone, and he has now an enclosure of nearly five thousand acres for his larger flocks. Mr. Douglas of Albany had his farm divided into about seven or eight large and well-fenced paddocks. It may be considered a settled law of ostrich-farming that free space and good fences are essential to success. Sheds, kraals, and houses are also necessary, not only for safe keeping, artificial hatching, and feather-gathering, but also for shelter from the cold and wet. The grazing ground best suited for the ostrich is that in which the soil or plants are rich in alkalies. When this is not the case, the needful element must be supplied."²

On this subject Mr. Henry de Mosenthal, writing

¹ "The Empire" (South African journal), 9th August 1875.

² Silver's "Handbook for South Africa," pp. 221, 222.

from Port Elizabeth in October 1875, says—"Important points to be considered are the space which the birds require, and the cost of enclosure. On a farm of 300 morgen (a morgen being about two acres) one may keep about eighty birds on soft karoo veldt, about a hundred on grass veldt, but not more than fifty on hard karoo. Loose stone walls cost from a shilling to eighteenpence a yard, according to the district. And where no walls can be built for want of stones, wire fences may be made. It has been found that four horizontal wires of galvanised iron are sufficient for an ostrich enclosure, and the cost of this, with the necessary uprights, may be put down at a shilling per yard. So that an enclosure of the above dimensions will cost from £350 to £500."

The following notes on ostrich-farming at the Cape were sent to the Council of the Zoological and Acclimatisation Society of Victoria in 1873, and appear in the "Proceedings" of that Society for that year. They were written by a gentleman who resided many years in South Africa, and who had frequent opportunities of observing the mode of managing ostriches in that colony.

"As a resident in South Africa," he says, "for eighteen years, in the districts lying north of the Orange River, where, in fact, the ostrich country begins, I beg to offer a few remarks for the general information of those who are not aware of the pecuniary advantages to be derived from the prosecution of this novel enterprise.

"I was particularly impressed with the idea of such a scheme on my first visit to the western district some four years since. Previous to my departure from Africa in 1867, the experiment had been tried in various localities

in the eastern province, between Graham's Town, Algoa Bay, and Cape Town. Dr. Atherstone took a prominent part in impressing upon the farmers generally the possibility of such an enterprise proving successful. The only outlay requisite (a far more serious one than Victorians imagine, from the scarcity of timber and the expensive land transport) being the cost of enclosing a portion of their farms, the whole area of which is generally from 3000 to 5000 morgen, or 6000 to 10,000 acres. Many years ago, the ostrich and other kinds of large game, such as the giraffe, koodoo, gnu, blesbok, hartebeeste, &c., &c., were indigenous to that part of the country, but the influx of settlers, and the consequent erection of numerous villages and towns, caused the game to emigrate across the Great Orange River, where they still continue to recede as the white man advances.

"The ostrich is now being domesticated by a nomadic people, who are aware of the value of these birds. A full-grown male ostrich will yield about one pound of first-class feathers, of which it takes from ninety to one hundred to the pound, the value of which in Port Elizabeth or Cape Town would be from £42 to £50 per pound. The second-class feathers, which are neither so long nor so broad, and have not got the spotless purity of the first quality, realise from £20 to £30 per pound. The small black tips from the back and breast are exported chiefly for the regimental bonnets worn by Highland regiments, the plumes of hearses, and various other purposes of a less grave character, and are sold at nominal prices; of course, all these are taken from birds that have been destroyed by native and other hunters, and some idea may be formed of the extent of this pursuit when I state, that some few years since, at the

village of Hope Town, almost bordering on the present diamond fields, I saw offered for sale in one lot eight hundredweights of feathers that had just arrived from the interior, from Mr Moffat, a trader, the brother-in-law of Dr. Livingstone ; and at the present day it is by no means uncommon to meet a wild untutored Kaffir or Hottentot boy with three or four first-class feathers stuck jauntily through his ears, or fastened in his woolly head, of a length and beauty which would be calculated to excite the envy and admiration of many a European belle. But I am digressing. My reason for considering that ostrich-farming would prove a success in this country is the compact and secure manner in which the majority of the stations here are fenced in. It is an erroneous idea that, because the ostrich is a very long-legged bird, it would require a very high fence to keep it in bounds. Such is not the case ; the substantial wire-fencing that I have seen at most well-kept stations, is, in my opinion, quite high enough. An ostrich in motion does not rise upon the wing ; he skims, as it were, along the surface of the ground, and if he meets with any obstacle, such as a fence, he will skirt along it, but never attempt to cross it, although he will cross a creek, the two banks of which are nearly on a level with each other, by flying. The pace of an ostrich in full speed, going before the wind, with his feathers standing erect, is killing ; and I never saw the horse the rider of which could with truth say that he ran his game down fairly. The ostrich is a solitary bird, and of lonely, shy habits. Ostriches are never found in large troops like other game ; seldom more than six are seen together, and they run more frequently in pairs or singly. Their sense of smell is very acute, as

well as their sight, and their powers of digestion are truly astonishing. I have seen a tame one snatch a bunch of keys attached to a steel ring from a man, and swallow them with the greatest gusto, and I have given young birds, when about the size of turkeys, a few small nails (tacks) occasionally, which they seemed to relish amazingly, and would follow me about for more, so that it would appear essential for them (!). Sir Henry Barkly, in his letters, recommends an incubator ; but it appears to me that this method would not be required here, for this reason, if you have the birds to lay the eggs, why not let them finish their work ? This they most assuredly will do if left undisturbed to themselves. The process of hatching is performed by the male and female sitting alternately, one keeping a vigilant look out as sentry, as well as procuring food. The only reason that I can assign for the use of incubators in the eastern province districts at the Cape is from the fact of the almost universal system adopted by the Dutch Boers and the natives of robbing every nest that they find of all the eggs it contains, which are generally from eighteen to twenty-four in number. These are brought by the farmers in their waggons when they come to the Nacht Maal or sacramental services, to such towns or villages as can boast of a Dutch church, where they exchange them in the stores for trifling necessities. Their selling value in Africa is about sixpence each, and they find their way into the other parts of the colony amongst the farmers, who would then resort to artificial means of hatching them, and of so obtaining a troop of birds. This system of robbing the nests will rapidly cause them to be almost exterminated, and will prove a grievous loss to the colony, which it can ill afford.

“Ostrich-farming will eventually prove remunerative in this country, and become more general as the birds increase in number. They should have a good *open* country, free from the shade of timber, and if the soil be sandy, or has sandy patches about it, so much the better, as it will be the more natural to them, and in those sandy places they will generally deposit their eggs. Before concluding, I may state that I examined some feathers from the Australian birds that were offered for sale by Messrs. Gemmell, Tuckett, & Co., some time ago, on account of the Acclimatisation Society, but not one presented the appearance of even second-class feathers, and yet they realised very high prices, that would astonish an African dealer. Subsequently, I saw some that were exhibited in a glass case at the Technological Museum, and they are much about the same quality. Why they should be curled artificially, and dyed, I am at a loss to imagine, as it destroys the natural drooping beauty of the feather, and as specimens for exhibition in a museum, they should have been left in their natural state. The eggs, also, are very much smaller than any I ever saw in Africa from birds in their native state. I fear that over-eagerness was displayed in order to realise something from the imported birds, as the feathers appear to have been taken from them before they reached maturity; and some that I noticed were so small, that to strip them from living birds was, if not cruel, unwise, as it was calculated to expose the creatures to chill and cold, which, if it did not prove fatal, was very likely to weaken the ensuing crop of feathers, not only in the length of shaft, but in one of the chief beauties of good feathers, its breadth.

The average length of a really good feather is about two feet, and eight to nine inches wide.

“In bringing these few remarks to a conclusion, I would merely recommend any society or individual desirous of importing ostriches to endeavour to procure them when they are about the size of a turkey-cock; they will not then be so unwieldy or unmanageable as full-grown birds, and can be more readily provided for and protected on ship-board. By offering a small bonus to some of the officers there would be very little danger of their failing to come safely to hand.”

The best report on ostrich-farming with which we are acquainted is that which was prepared by Dr. W. G. Atherstone of Graham's Town, at the request of Sir Henry Barkly, for the Zoological and Acclimatisation Society of Victoria, and published in the “Proceedings” of that Society for 1874.¹

This report, based as it is on observations made by Dr. Atherstone and some of his friends on different farms in the neighbourhood of Graham's Town, and containing as it does so much practical information, deserves to be read *in extenso*.

“This new and important branch of industry,” he says, “is beginning to attract considerable attention here, and deserves the serious consideration of all interested in the welfare of the colony. The export of feathers is rapidly increasing every year in quantity and value, not so much, I believe, from wild feathers, indicative of the progressive destruction of the ostrich, as from the increase of the domesticated birds and their

¹ This report was reprinted in the “Australasian” and “Cape Monthly Magazine,” and furnished material for the account of ostrich-farming which subsequently appeared in Silver's “Handbook for South Africa.”

more successful management, by which the feathers at one time considered vastly inferior to those of the bird in its wild state are now proved by market value to be equal if not superior in quality. I have myself seen, during the last eighteen months, upwards of five hundred domesticated ostriches in different districts of the colony in the eastern and western provinces, under varying conditions as to soil, climate, and management, some in enclosures, some herded in large flocks like sheep, without enclosure or shelter of any kind, and from my own observations and the inquiries I have made, I am of opinion that the success of ostrich-farming, like that of sheep-farming, depends more upon the character of the veldt (or soil and grazing ground) and diet than upon climatic conditions. Exposure to wet and cold does not appear to be injurious to birds in full health and vigour, but it kills them if weak or out of condition. It is advisable, however, to protect them by shelter of some kind from the cold rains of winter in the domesticated state. The natural home of the ostrich and antelope is found in the 'karroo' plains and sweet-grass flats of the interior, and although, like the springbok, the ostrich occasionally resorts to the long sour grass of coast-lands, where perhaps the lime and salt replace the alkalies of the 'sweet grass' and 'karroo', neither will thrive for any length of time on the 'strand veldt' or the 'sour grass' of the sandstone ranges, deficient in alkalies. Alkalies, in some form or other, seem to be necessary to the very existence of sheep, bucks, and ostriches; and where these do not exist on the soil or plants, they must be supplied artificially to ensure the healthy condition of the animal, and the proper growth of the wool, hair, and feathers. It is for this reason that salt, so

necessary for all domesticated animals, is in some parts of the Brazils said to be worth its weight in gold. I have heard of a house, the walls of which (made of brack ground) were nearly eaten through by a span of zuur-veldt oxen let loose on the reef. The attraction of the salt-licks or pans in the interior for game and stock is well known. This natural want may often be recognised at a glance on the surface of a farm. No bones are seen lying about on a zuur-veldt farm, all being greedily devoured by the stock ; cattle and sheep crush them up, and ostriches swallow them whole ; whereas on a sweet-veldt farm, whose soil and shrubs are rich in alkalies, the bones are untouched ; nothing requires them. There are three farms adjoining each other within a dozen miles of Graham's Town, on which upwards of 150 ostriches are kept, which strikingly exemplify this fact, and this comparative adaptability of different soils and pasture for sheep, angoras, and ostriches.

“Kruisfontein, on the south, belonging to my brother, John Atherstone, is an unmitigated zuur-veldt farm, situated on the sandstone range called the Zuurberg, which skirts Graham's Town on the south. There is no limestone on the farm. He has been at considerable expense in sheds, enclosures, and artificial feeding, and though successful at last, it has been only attained through dear-bought experience. Angoras do not succeed, and, as a rule, wethers only thrive well ; lambs are reared with difficulty, and ostriches require a large amount of artificial food, mealies and green crops, and require crushed bones, which they devour greedily. Until this place was adapted, the birds were in low condition, unhealthy, and the feathers inferior and interrupted in their growth.

“Since the supply of bone-dust (he gives a quarter of a pound of sulphur to two buckets of crushed bones with salt), the improvement in the quality and value has been very marked, and the condition of the birds greatly improved. The yield and quality of the feathers appear to be directly proportionate to the health and vigour of the bird. Limestone, from the coast-land, was tried at first, as the birds would not lay; it was broken up and scattered about, but the birds would not touch it. The phosphate of lime of the bones was the thing wanted, and they rushed at the bones with avidity, and immediately began to improve in health and to lay.

“Still, although he has had ostriches for nearly three years, and began with many full-grown birds, the attempts at incubation have been abortive from various causes, and he has had no increase. Of eighty-five birds originally placed on the farm in a 400-acre enclosure, he has lost twenty-seven—thirteen by cold and wet, three by diphtheria, six killed by natives, three by fighting, and two by falling into holes. He has five more males than females. Of sixty eggs, nineteen were destroyed by black crows, which were seen from the house to hover over the nest and let stones fall¹ on the eggs (on running up on one occasion to the nest, about 600 yards off, he found three stones in the nest, the eggs cracked, and the yolk strewed about); forty-one were sent to the adjoining farm, Hilton, to be artificially incubated, but these failed, probably from having been shaken, although they were carried in baskets on the heads of native women. He has received

¹ It seems that other birds besides crows make use of stones for the purpose of breaking the eggs. See Mr. Meyer's account of vultures breaking ostriches eggs, *ante*, p. 40.

£1450 for his feathers, plucking them every eight months, selecting the ripe feathers only, and plucking about sixty at a time. He finds it injures the bird and produces irritation-fever to pluck too many at once. His experience leads him to the opinion that the ostrich cannot stand exposure to wet or cold. This farm is rather higher (about 200 feet or 300 feet) than the other two, and therefore, perhaps, colder.

“The next farm, Hilton, is like the table-farm adjoining it, on the junction between the sandstones of the Lunberg and the schists and trap conglomerate formation, mixed veldt, partly sour and partly sweet grass, the soil rich in alkalies, which often effervesce on the surface in the hollows. On Hilton, Mr. Arthur Douglas has now seventy-one birds, kept in an enclosure of 300 acres, in good condition, and requiring very little artificial food. They lay well, and do not appear to suffer from exposure to wet or cold, although they have no shelter. He commenced about three years ago with eleven birds, he has now seventy-one; he has successfully hatched seventy—forty artificially in the incubator. They have paired and hatched their young in the natural state, which has enabled him to watch them; and he has thus acquired much valuable information regarding their habits and the natural mode of incubation. The male birds are very ferocious during the breeding season, and it is dangerous to approach them. Mr. Douglas has had several very narrow escapes. They sit alternately, the male at night grazing and guarding the female. During the daytime, the time of the male bird going on the nest varies during the period of incubation, as also does the time between the female leaving the nest and the male taking her place, the exposure and cooling

being probably regulated by the temperature of the incubation fever at different stages. All these apparently trivial minutiae are yet matters of considerable importance in artificial incubation, and only to be acquired by patient watching and judicious application of the principles involved in machine-hatching.

“ ‘Black Kloof,’ which adjoins Hilton on the north-east, is on the trap conglomerate—a purely sweet-veldt farm, with many of the bitter and aromatic shrubs of the karoo. Here, Mr. George White, my brother-in-law, has twenty-three young ostriches in an enclosure of 500 acres, thriving well, in good condition, and yielding feathers of excellent quality. As a rule, he gives no artificial food; they thrive and fatten on the scanty scrub and sweet grass in the enclosure only. Last year, when he put several hundred sheep and goats into the same enclosure, the birds were nearly starved, but they regained their condition as soon as the sheep were removed. They have no shelter of any kind, and have not suffered at all from rain or cold. He began with seven—four males and three females, all chicks, their sex undistinguishable from their plumage. He has had them sixteen months, and has not lost one. He plucks them twice a year. In rainy weather they do not even seek the slight shelter of the walls, but group themselves in the open ground, not appearing to care for cold or wet. The rocks, soil, and herbage contain alkalis in abundance, and the water is brackish, as the name of the farm implies. Sheep and angoras and cattle thrive well, and no bones are eaten by the stock; they lie scattered about everywhere. The contrast between the farms is very marked, and their comparative fitness for ostrich-farming. Ostriches require, as a rule, I think,

'sweet-veldt,' variety of food, and a large extent of grazing ground to roam over, to keep them in health and vigour.

"The Wimmera district, as I am informed by Mr. E. J. Dunn, geologist, who is intimately acquainted with the district, is ill adapted to the successful rearing of ostriches, although when reared they may thrive very well with artificial food. Mr. Dunn, who has lately travelled a good deal in our colony, and knows the peculiarity of our sweet and sour veldts, recommends the banks of the Loddon, near Baringhup, as better adapted for experimental ostrich-farming; it is, he says, sweet veldt, and the high banks and rich flats along the river, and the high banks and stony ground above it, are more likely to suit the birds—the lucerne also growing luxuriantly there, which is one of the best green crops for ostriches. My brother gives two hundred pounds to three hundred pounds of lucerne daily to his birds, besides mealies or Indian-corn (one pound to each bird). With regard to plucking the feathers, which unfortunately are in prime condition at the period of incubation, when the plucking of them would interfere sadly with the birds, different opinions are entertained. Some pluck, some cut off the feathers close to their insertion; some separate some of the males from the females about the time of incubation, and then pluck them. My own opinion is, that the best plan is that adopted by a farmer in the western district, who had seventy or eighty ostriches, and found the plan the best and most convenient. To show me the process, he had the whole flock driven in, and we then insinuated ourselves by wriggling amongst the densely packed birds. He had previously shown me what to do in case of

any bird proving vicious. They are perfectly in your power if you seize them by the neck; you may then choke them as far as you please until you find them powerless, and you can then run away. Having got with my friend into the middle of the crowd, so packed that they were unable to move, he quietly selected two or three of the best feathers, and with a very sharp curved knife in his right hand, the blade protected by lying flat against his finger, he pressed it down as near the root as he could, and cut it off obliquely upwards. The bird was quite unconscious of the operation, standing perfectly still as he handed several to me; he then picked out a blood feather, very beautiful, which on being cut bled a little, but the sharp knife separated it without it being felt. In a month or six weeks he took out all the stumps, if they had not already fallen out. By this means the health of the bird is not impaired, no irritation-fever is produced, as in the case of my brother's birds, and you can select the feathers that are in prime condition, leaving the others to ripen in due course. Still the process of incubation injures a great many valuable feathers, and it appears, therefore, clear to me that some mode of artificial incubation must be attempted to derive all the advantages possible from this new branch of industry. I therefore wrote to my son in London about three years ago, early in 1869, I think, requesting him to hunt up some incubator for hen's eggs, hoping by giving him the size of the egg, habits of ostrich, &c., to be enabled to get a machine adapted for hatching ostriches. He sent me a letter in reply, and a prospectus from Mr. W. H. Thick, 188 Wellington Road, Kentish Town, London, W.C., offering to construct one if I sent him all particulars. I had great difficulty in

inducing any one to enter on the risk. My brother declined, preferring to wait till he saw if his birds would not breed in their natural state, and hatch their young. Not being a farmer myself, although perceiving at once the immense value of such an important aid to this second diamond-discovery, or rather gold-discovery, to the colony (for feathers were realising their weight in gold—£45 a pound, and single feathers 15s. to £1 each, or about £60), I could not myself carry out the idea. At last I persuaded Mr. Arthur Douglas of Hilton to send home an order for one of Mr. Thick's machines, which on the road from Port Elizabeth was unfortunately broken to pieces. However, by constructing another on the same principle, which was afterwards varied to suit the new phenomena that presented themselves during the experimental incubation; and taking advantage of the practical lessons of the birds actually on the nest, testing their temperature, &c., Mr. Douglas has succeeded in making a machine which has proved very efficient, though in many respects differing from the one originally imported. Several ostrich-farmers have had his improved incubator, and have been perfectly satisfied with their success. It is astonishing what slight causes will cause the failure of eggs, a thunder-storm has been known to destroy them, even the rough opening of the drawer containing the eggs will shake and injure them, and too great or too little heat proves fatal to the chicks. By this plan one male to three females is sufficient; in a natural state of course there must be an equal number, as both sit alternately. I saw large herds of ostriches near Colesberg, 150 in a flock at least, herded by only two men on horseback with long whips on open flats. I presume mealies tempted

them to the homestead in the evening, where they remained on the 'reef' until the next morning."

A visit to Mr. Douglas's ostrich-farm at Hilton is thus described by Mr. Hellier of Graham's Town:—

"Hilton lies some twelve miles from Graham's Town, some two miles or less off to left or west of the Cradock Road. The house stands in the middle of a lawn-like flat, which in England we should call a meadow, and in relation to the house, the 'home ground.' We were quite surprised to see such a building—three stories high, and quite a contrast to the usual farmhouses of the colony. To those who know the hospitalities of the country we need not detail what happened on our arrival. After breakfast we began on foot at first to make our round of the various ostrich flocks and troops, scattered or located as they are over a farm of some 3000 morgen (6000 acres); and as we shall require the aid of the artificial memory afforded by the recollection of the way we went, we will tell our story in that order, beginning where we began with the first flock of this year's chickens we came to. The first chickens of this year were hatched in the early part of the month of August, and these, with others hatched during the following month or six weeks, now run together, and form a flock of forty-four fine, healthy, growing birds. Some of them are very large for their age, and all are remarkably lively, and in good condition. It was very amusing to see how they gathered round the coloured boy who looked after them. They ran away to him if startled in any way, and came eagerly at his call.

"It was evident that their instincts had accepted him in the place of their original parents. These birds are now housed every night, and though this will no doubt

be prudent for some time to come on account of storms, yet some of the oldest look quite able to take care of themselves. In fact, were they with their parent birds, they could not be gathered many of them under their wings, or otherwise much defended from the cold. This group of young birds are kept in the home field, and, we believe, occasionally get a little lucerne. The condition and health of this flock of birds is most satisfactory. It proves most triumphantly that ostriches hatched by machine, when the operation is properly conducted, are equally healthy with those that come into the world by the old-established and ordinary process; and that the same set of conditions must have been complied with, and the various necessary manipulations which instinct teaches the old birds to perform, must have been successfully imitated in artificial incubation. We think Mr. Douglas told us he had lost but one since they were hatched, and this by accident. The next troop of this year's birds is a flock of sixteen. They looked to us about a month old. We were not told their age. These, too, looked exceedingly healthy. A boy was in attendance, and will continue so a little longer, till they are strong enough to join their elder brothers and sisters. This little family is carefully housed every night in a warm covered stable. We forgot to say the older flock are put in a kind of kraal within the shed, into which they can run when it rains. By this plan they get gradually accustomed to sleep out at night. The next flock we saw was the baby flock of fourteen, some of which were only a day or two old, while some were a week or ten days; for, as we shall see when we come to speak of the 'incubator,' like some of our committees, there is power to add

to their number. These were exceedingly pretty little things, like giant young partridges, but with the special peculiarity of having little bristles all over them mixed with their down. They were very lively, and gathered round their guardian, and were some of them fed with a little cut lucerne. We were told that for the first day or two after their birth they do not eat, but seem to be looking about curiously upon the great world they have so strangely come into. Then, after two days, they begin to attend to the duties of life by setting up a mill. This is precisely the fact. The little things, taught by instinct, eat no food till their gizzards are prepared, for which purpose they go about picking up little hard stones, of no doubt the exact kind required. After this preparatory process is completed they eat a little soft green food. This infant flock is gathered into a warm room at night; some of the youngest are put into the 'mother' crib of the incubator, while others are accommodated with a lodging between blankets, or otherwise comfortably provided for. We find, by adding together the above flocks, we have some seventy-five chickens, all hatched since August by the incubator—all alive and well.

"We next mounted our horses, and proceeded to an enclosure separated by the river from the home ground. In this enclosure we found fifteen full-grown birds, or mostly full grown, among which were an old cock and two laying hens, and possibly a pullet, which Mr. Douglas told us he thought was just beginning to lay. The old cock was very savage and fightable, and was given some mealies (maize) to amuse him while we rode quietly by. The old fellow attacked his master while on horseback some little time ago. He succeeded in

getting his breast up to the horse, and kicked most furiously, but owing to the unusual position he had attained, his kicks went for nothing, except once, when his toe ripped open the skin of the horse's flank, which set the horse going in turn. The fact is, if the old birds only knew how to use their beaks as well as their feet, they would be most dangerous animals—as it is, though they peck off your hat, and pull your ears, their operations in this way are nothing much. These fifteen birds have a large enclosure all to themselves. And here we may as well say that there are no sheep on the farm, and in the enclosures dedicated to the ostriches, except in the home field, there is no other kind of stock. We next, after a mile more or less, came to an enclosure in which were a very fine old cock and two laying hens. Here we were shown a nest, after due precaution having been taken to decoy the old monarch into a pen with some mealies, and safely shut him up; but we must confess we gave one or two rather anxious looks towards the pen aforesaid, thinking it just possible he might get out of that and come and look after us. The two hens were both sitting down, which we were informed they do; also, that when the one goes to lay, the other goes to keep her company, though we did not inquire whether that was the etiquette of ostrich life—shall we say good breeding, or the special habits of these two birds. We were informed that the hens lay their eggs somewhere round about the nest, that is, within a few yards, and that the cock bird trundles them along, and places them in due order in the nest. In fact, the male ostrich seems the very antipodes of roosters and drakes, for he takes the chief solicitude about the future of the eggs, placing them in the nest, and always sitting

on them by night, with warding and divers other little attentions and performances necessary to a successful issue of incubation, which our good friend Mr. Douglas has carefully observed, after much patient watching, and duly made a note of. Here we saw a fine nest of eggs, and proceeded to count them, but were stopped with the information that they would never hatch. No! never; and why? Simply that they were artificial; and so good is the imitation, that they deceived not only novices like ourselves, but even the ostriches, who ought to have known better.

“ Out of the enclosure given up to the exclusive use of this polygamous family of three, we entered through a locked gate into a large enclosure or paddock, in which were fifty-eight one and two year old birds. They all looked exceedingly well, and though they did not dance, they seemed full of life. They do sometimes favour the spectators with a dance, and it is one of the funniest of all the freaks or habits of animals that evidence a sense of the jokeful we ever beheld. We once saw some twenty nearly full-grown birds waltzing together. They began with a sort of sidling slow revolution on their toes, moving their wings gently up and down, and presently they seemed to get into the spirit of the thing without the aid of any fiddler that we saw, and spun round at a rate that would have astonished any one but a dancing dervish. In dancing, they swept round and round without ever coming into contact with each other. Our fifty-eight young friends soon seemed anxious to make our acquaintance, or perhaps more especially to see if there were any mealies, and they came up all round us, some two or three at a time poking their little and long necks right into one's face. Quite

docile and quiet, yet they seemed very inquisitive, and we should fully have expected, had we indulged in such vanities, to have seen our diamond breastpin disappear, as a specially valuable stone to furnish grinding power for the bird. It is a queer feeling to be in the middle and under the inspection of some fifty pair of eyes or more, with a good sharp bill between each pair that could easily appropriate—or say borrow—any little thing they take a fancy to. It was queer, but it was most satisfactory, for here were birds two years old, machine hatched, and in size, health, and quality everything that could be desired.

“This completed our round of observation, in which we saw a good many contrivances for feeding, plucking, and general management, the result of much thought and patient investigation. Since the farm has had no sheep on it the veldt has very much improved, and no doubt is still progressing in the same satisfactory direction.

“We have spoken of various enclosures; there must be at Hilton several miles of fencing completed; and we saw another mile or more under operation. The difficulty in getting sneezewood posts has hindered the operation; but the fence is being put up with occasional sneezewood, the other more perishable posts to be supplemented with sneeze when it can be procured. There is, in addition to the river running round it, in the body of the farm a good dam, from which the water is led by a syphon.

“We saw the incubator, and in it forty-five eggs in the process of hatching. This operation is now performed almost to perfection, quite equal to anything the parent birds can do themselves, even supposing they are

unmolested, and escape all kinds of accidents to which they are exposed. Out of the forty-five eggs we saw, we may safely conclude forty-two would produce live and healthy chicks. The result now of several batches is for fourteen out of fifteen to be hatched. And Mr. Douglas seems pretty sanguine that he will ultimately hatch all the eggs placed in the incubator, provided they are fertile.

“The number of ostriches at Hilton is as follows:—Breeding birds—Males, 2; four hens and one pullet, 5; full-grown and nearly full-grown birds, 14; one-year and two-year old birds, 59; this year's chickens, 75; in all, 155.

“And though we have every respect for the old proverb, yet, with the experience aforesaid, we have every confidence in adding forty-two more for the eggs now in the machine, besides which, some of the hens are laying every day. They laid last year up to May, when they were permitted to hatch a small clutch of eggs themselves, as it was thought they ought to have a rest—we mean a rest from laying. We must leave it to the imagination of our readers to add up the total amount of one year's produce from say seven birds—though it is only six in reality—through the intervention of artificial incubators. And we think that he must be not only an imaginative man, but something else, who tries to carry on ostrich-farming without an incubator. One other fact, we think, is established, namely, that ostriches must have plenty of room.”

A writer in the “*Revue des Deux Mondes*,” in an instructive article upon the diamond-fields at the Cape,¹

¹ Desdemaines-Hugon, “*Les Mines de Diamans du Cap*,” “*Revue des Deux Mondes*,” 1874, vol. iii. p. 575.

thus incidentally alludes to the new industry of ostrich-farming :—

“Pour l'élève des autruches comme pour toutes les autres branches de l'industrie, le progrès s'est fait avec le temps, et les propriétaires commencent à comprendre qu'il est de leur intérêt immédiat de soigner ces animaux utiles et de les apprivoiser, afin de rendre plus facile la récolte des plumes, qu'autrefois on n'obtenait qu'après des luttes acharnées contre les autruches absolument sauvages par leur genre de vie, et habituées à considérer l'homme comme un ennemi contre lequel il fallait se défendre. Ces luttes endommageaient les plumes et faisaient quelquefois blesser l'animal par la violence qu'on employait pour s'en emparer. Afin de calmer son naturel farouche, quelques hommes de bon sens ont essayé l'emploi de couveuses artificielles, et, sans se rebutter des nombreux tâtonnemens qui les attendaient, sont arrivés à voir couronner leurs efforts d'un succès qui a dépassé toutes leurs espérances.”

Although, where circumstances will permit, it is considered better to hatch the young birds in the natural way, yet a considerable number are now reared by means of artificial incubators, and it has been found that not only can a larger percentage of eggs be saved in this way, but the young so hatched are no less healthy than if brought up by their parents.¹

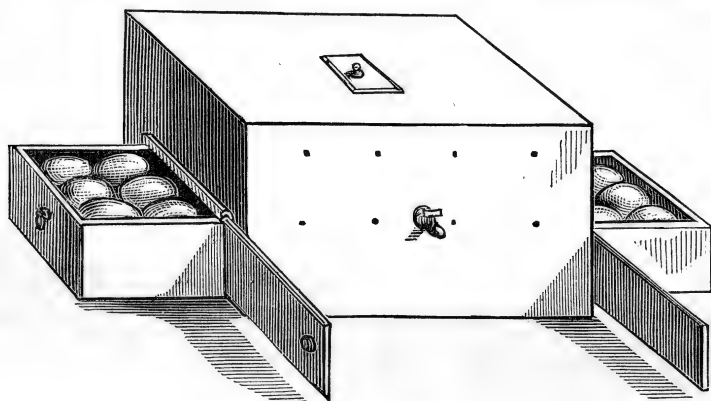
The apparatus devised and patented by Mr. Douglas, to which we have already alluded, and which has recently been exhibited by him at the Philadelphia Exhibition, is admirably adapted to the purpose required. It is so constructed that the eggs are brought into contact with

¹ Von Maltitz in the “Cape Argus,” 22d April 1875.

copper plates, which are heated by warm water to a proper temperature. By means of this incubator, he succeeded in rearing from six ostriches (four hens and two cocks) one hundred and thirty young birds in one season. It is thus described by Mr. John Noble, clerk of the Cape House of Assembly, in his Handbook of the Cape Colony :—

“The incubator consists of a wooden box, about three feet square, open from above, and capable of containing twenty-five eggs. It rests upon a copper or zinc pan or cistern, three inches deep, and equal to the size of the box. This is filled with hot water, and has four or five openings through which the vapour ascends into the box. The warm temperature of the water is maintained by a paraffin lamp kept burning underneath the pan ; but in some cases this has been found objectionable, as the fumes of the lamp affect the young chicks as they leave the egg, and it is an improvement to have the lamp burning in an adjoining compartment, an extension of the cistern or pan about a foot wide being carried through the partition or wall, and the lamp placed under it. The heat can be regulated as necessary, thermometers being constantly in use. The temperature of the box where the eggs are placed is 102° Fahr. when they are first put in ; after two weeks it is gradually reduced to 100°, and in two weeks more to 98°. The period of incubation is forty-two days. The eggs are turned and aired by opening the box and blanket covering once or twice a day. A fortnight before the expiration of the time, they are held up against the light to examine their condition, and a week after are slightly, but carefully, punctured near the top, with a sharp-pointed steel, to enable any of the chicks in weak condition the more readily to break the shell.”

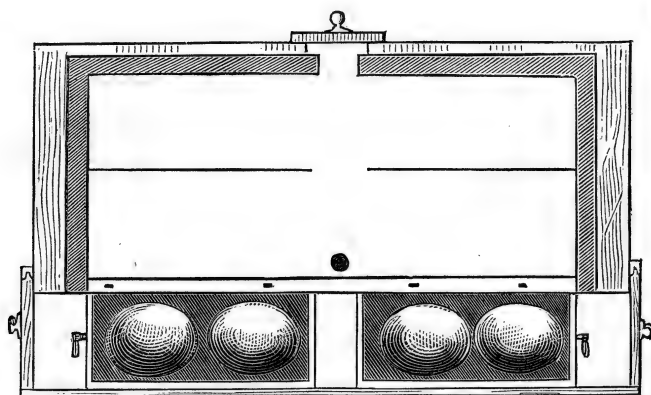
Another form of incubator, of which we give a drawing, is the design of a young engineer employed at the Acclimatisation Gardens at Algiers, who has made artificial incubation his special study. A model of this machine was exhibited in the Cape Department at the Vienna Exhibition. The mode of using it may be thus described:—The incubator is placed on a wooden ground-floor, and covered with a woollen blanket. The room must be well aired, clean, dry, and quiet, away from the stable



Artificial Incubator.

and the kitchen. There must be no offensive smell, no cats—and persons approaching must not smoke. In winter the room must be kept warm; its temperature must not descend below 55° Fahr. The cistern of the incubator must be quite full, but not overflowing. Two gallons of boiling water must be kept in readiness to keep up the requisite heat in the cistern. When you commence, fill the cistern with hot water, 190° ; let it cool down to 118° ; leave the thermometer in the drawer; ascertain after a time whether the temperature in the drawer is 105° before you put in the eggs; keep it from 104° to 105° during the first twenty-three days, and

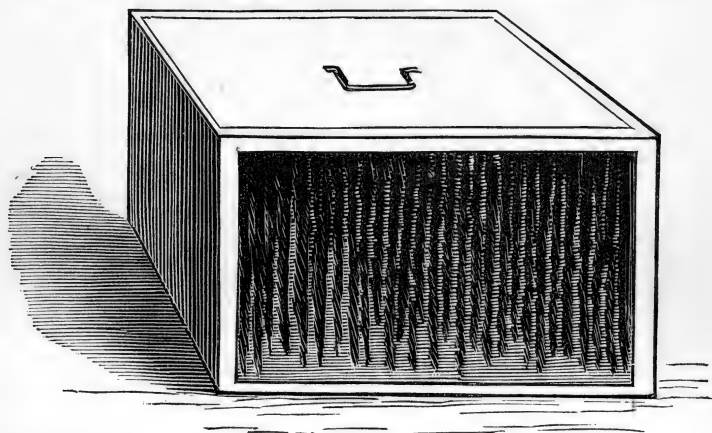
then lower it to 102° : 104° is the natural heat of the ostrich mother. Ascertain every three hours that it is maintained; warmer it must not be. Each drawer is constructed to hold six eggs, which must be fresh laid, cleaned, and secured with clean cotton, so that they do not roll about, nor touch one another. During the first twenty-three days the eggs must reach the top line, as marked in the drawer, not beyond; the following twelve days to the second line; and for the remainder of the time until they are hatched to the third and lowest



Section of Incubator.

line. The necessary wooden divisions are in the drawer. The space between the line is three-eighths of an inch. For ten or fifteen minutes, according to the season, every morning and evening, the eggs should be aired and turned, so that the part which faced the cistern in the daytime cools at night, and *vice versa*. They will be hatched in from forty-five to fifty days. The young bird will pierce the shell itself, and need not be assisted. As soon as they are out of the shell they should be kept in a basket, in some clean, dry, warm stuff (chenille or cotton wool), for twenty-four hours, but sufficiently ex-

posed to the air to admit of their breathing freely. A good plan is to construct a coop, as shown in the engraving below, from the roof of which is hung a lot of warm chenille. Into this the young birds creep and nestle, and it acts the part of an artificial mother. They should be fed at first on bread crumbs, bran, and water. On the fourth day a little enclosure may be made round the incubator, and the young birds may be allowed out during the day. They may then have grain, bread, green vegetables, and water. At night they should be taken under shelter as a precautionary measure, and in



Artificial Mother.

each enclosure there should be a shed in which they can take refuge by day in the event of a storm. Great mortality prevails from the day of birth until they are about three months old, after which time the chief danger is over. But although few die after that age, a good many break their legs, in which case they generally have to be killed. Ostriches are not expensive to keep, for during the greater portion of the year they can find enough to live upon in their enclosures, and at other

times only require a little Indian-corn or beans, and some additional green food in the shape of lucerne, all which can be grown on the farm.

In Algeria Captain Crépu found that the birds thrive well on barley, fresh grass, cabbage, and the leaves of the cactus or Barbary fig chopped fine. He recommends about three pounds avoirdupois of barley a-day for each bird, and green food according to circumstances. In winter, and during the breeding season, a more plentiful supply than usual should be given.

Mr. Kinnear states that for their usual food nothing equals lucerne or trefoil, but they also like cabbage leaves, fruit, and grain. Maize or Indian-corn, better known in the Colony as "mealies," they are very fond of.

As is the case with cattle, the nature of the soil and the climate must be carefully studied if ostrich-farming is to be carried out successfully. The birds will, of course, live, and to a certain extent thrive, on grass or sour veldt, but they do much better on the "karoo." Here they find and take into their system the natural alkalies which are so beneficial to their health, as well as the fruit and berries of various wild shrubs and plants, which, with grass and leaves, form their chief food when in a wild state. Under these conditions the birds grow well and strongly, and the feathers get finer, heavier, and more valuable.

The largest and longest feathers of commerce are those from South Africa, but being less flexible than those from Barbary and Aleppo, they rank after them in point of value. M. Jules Verreaux saw one from the Cape which measured over two feet in length, and was seven inches wide.

In 1826 ostrich feathers from the Cape paid a duty in

England of 20s. per pound. In 1832 this was reduced to 10s., and in 1845 the duty was wholly repealed.

In 1846 only 1327 pounds of feathers, of the estimated value of £8000, were exported from the Cape, and these were feathers obtained from wild birds that had been shot or hunted down. Since that date the export, both as regards quantity and value, has increased enormously, and this, of course, has been especially the case since ostrich-farming came into vogue.

Some idea of this large increase may be found on glancing at the figures in the following table, compiled from the returns of the Board of Trade :—

RETURN of the QUANTITY and VALUE of OSTRICH FEATHERS
exported from SOUTH AFRICA in the last Seventeen Years.

DATE.	FROM THE CAPE COLONY.		FROM NATAL.	
	Quantity.	Value.	Quantity.	Value.
	lbs.		lbs.	
1858	1,852	£12,688	84	£510
1859	2,972	19,018	70	391
1860	2,297	19,261	64	465
1861	3,475	24,142	110	564
1862	7,462	42,488	600	2,510
1863	10,275	72,834	1,746	7,255
1864	17,873	81,755	1,665	6,572
1865	17,811	66,426	2,025	11,299
1866	15,144	75,661	2,605	10,921
1867	18,921	75,221	4,426	11,200
1868	16,163	63,193	4,191	8,830
1869	18,920	70,750	2,133	4,757
1870	29,805	91,229	2,063	6,364
1871	25,508	150,769	1,706	6,910
1872	26,993	158,904	1,856	9,745
1873	31,581	159,677	1,535	5,940
1874	36,829	205,640	1,387	3,139

There is a certain fluctuation in the average value per

pound of the feathers, which it is difficult to explain without details of the quality, of the state of the markets, of the season, and other points. That increased production has been followed by diminished prices does not appear to be the case absolutely, though to a certain extent this natural sequence of events may have occurred. A reduced price, occurring contemporaneously with largely increased yield, is most apparent on the return for 1870, as compared with that for 1862, the value per pound being £2·99 in 1870 against £5·7 in 1862.

This may be accounted for by the fact of the increased yield of feathers, under the artificial system of producing them, having so suddenly followed upon a period of scarcity, as to have alarmed the merchants, who feared a general depreciation of the prices. The subsequent rally in prices is sufficient to prove the healthy tone of the market, and the prosperity of the trade, for we find that, after the large crop in 1870, which succeeded a comparatively poor period of production, and which has been followed by an annually increasing yield, prices, instead of falling, rose to an average of 50 per cent. higher per pound than had been maintained in the years immediately preceding. The average value per pound previous to 1870 was £3·8. Since then it has been £5·5, as the following table shows:—¹

AVERAGE PRICE PER POUND.

			Cape Colony.		Natal.
1868	.	.	£3·9	.	£2·1
1869	.	.	3·7	.	2·2
1870	.	.	2·99	.	3·08
1871	.	.	5·08	.	4·05
1872	.	.	5·9	.	5·2
1873	.	.	5·05	.	3·8
1874	.	.	5·6	.	8·0

¹ "The Colonies," a South African Journal, 30th October 1875.

Incredible as it may seem, an ostrich-feather merchant can, at a glance, distinguish from what locality the feather has come. There is as much difference in the feathers from Egypt, Tripoli, the Cape, Morocco, and Senegal, as there is in the various qualities of coffee and sugar, and the initiated perceive it at once and utilise their knowledge accordingly. The Barbary feathers are considered the most superior in fulness, breadth, colour, and gracefulness; they are consequently the most expensive. They are shipped from Tripoli *viâ* Marseilles to Paris, but sometimes also *viâ* Malta to Leghorn, where they are sorted and classified in bundles, and are thence forwarded to Paris and London. They are generally counted, not weighed, and rarely or never find their way to the public sales in London, being usually sold by private contract. The feathers from Egypt comprise those which are brought to Cairo from the various countries east and south of Egypt, from Arabia, and from the Upper Nile and the Desert. Those from the interior are brought by caravans to Cairo, and there they are "made up" for the European markets, that is to say, they are classed in different qualities and colours, and the bundles tied up with thick twine-rope or strips of leather, and sold by weight. This unfortunately leads to much deception; for in some cases, when unpacked, the bundle which is supposed to consist of 100 lbs. of feathers is found to contain 75 per cent. of rubbish. By far the largest quantity is sent *viâ* Marseilles to Paris; about one-tenth possibly finding its way to Southampton and London. In the monthly public sales of the metropolis, the quantity of "roped" feathers from Egypt, as compared with those from the Cape, is inconsiderable, and is looked upon with suspicion as being un-

fairly packed. In quality, the Egyptian feathers, excepting such as come from Arabia, are considered next to those from Barbary, although when bleached they are inferior in colour. Large quantities of so-called "tame" feathers come from Egypt. (See Appendix, Report from Egypt.) The next in quality are those from Mogador, which may be said to be about on a par in point of value with those from South Africa. They come from the kingdom of Morocco, and are mostly shipped from Mogador by steamer to London, where some of them occasionally find their way to the London public sales; but most of them are shipped to the order of London and Paris dealers. The feathers from Senegal are forwarded to Bordeaux, but some are shipped by the West Coast line of steamers to Liverpool, chiefly for French account.

The Cape feather ranks next to the Egyptian for quantity, although not for quality or graceful shape; it is superior however as regards colour, and bleaches to a more perfect white. With the exception of a small quantity shipped direct to Europe and the United States, they come direct to London by the Union and Colonial mail steamers, partly to the order of dealers, and partly by way of consignment, in which latter case they are sold at the monthly public sales in Mincing Lane. Dealers draw a distinction between Western and Eastern Cape feathers; the former being considered of richer plumage than the latter. Western feathers come from Damara-land (Walvisch Bay) and Namaqua-land (Port Nolloth) to Cape Town, where a smaller quantity from the different districts of the Western Provinces is also sent. Eastern feathers are forwarded to Port Elizabeth, Algoa Bay, and include small shipments

from Natal. They comprise the booty of all the countries of South Africa south of the River Zambesi, from the Transvaal Republic, the Orange Free State, and the immense tracts of lands beyond their borders in the interior, north and west, belonging as yet to no European power. They arrive sorted in the different qualities and colours, are consigned to Port Elizabeth merchants, and are sold by weight in the market by public sale or by private contract. None of the steamers running up and down the East Coast of Africa from the most northern port to Natal, and touching at Zanzibar, Mozambique, Quilimane, and Delagoa Bay, ever bring ostrich feathers. Nor do any of the boats plying on the west coast, from Senegal in the north to the most southern Portugese possession, so far as we are aware, carry them either.

The various qualities of feathers may thus be classified, according to the localities whence they are brought, commencing with the finest from Aleppo :—

- A. Aleppo, from the Syrian desert ; the most perfect in plumage, breadth, grace, and colour, but very rare.
- B. Barbary, from Tripoli.
- C. St. Louis, from Senegal.
- D. Egypt; these do not bleach to the best white.
- E. Mogador, from Morocco.
- F. Cape ; although as perfect in colour as those of Aleppo, they are much inferior in quality.
- G. Yamani, from Arabia—commonly but erroneously designated “Senegal :” the most inferior in plumage, being thin and poor.

The difference between a feather from a wild and one from a tame bird is immediately perceptible to the connoisseur. The so-called “tame feather” is much stiffer, has not the natural graceful fall of the

wild feather, has "galleries" in the quill, and even when dressed and curled, becomes stiff again after a time. Having a thin cut quill, also, it is lighter than the wild one. One hundred and twenty best white tame feathers weigh one pound or thereabouts. The same number of the finest white wild "blood-feathers" weigh a pound, but in point of value they are worth more than double. Should the quantity of tame white feathers become trebled or even quadrupled within the next five years, they will still remain a staple article of commerce, and will not become, as some have predicted, "a drug in the market." This large increase in quantity, however, will naturally influence the value to a considerable extent. The total annual value of ostrich feathers at present exported from Africa (see Appendix) may be estimated in round numbers as follows:—

Egypt,	£250,000
The Cape,	230,000
Barbary,	100,000
Mogador,	20,000
Senegal,	3,000
	<hr/>
	£603,000

The sorting and classification of the feathers as they arrive requires much judgment and experience. The following table will show the way in which they are arranged in order of value, beginning with the best:—

CLASSIFICATION OF CAPE OSTRICH FEATHERS

FOR LONDON PUBLIC SALES.

WHITE.	<i>Wild</i> ,	blood feathers, fine.
"	"	Prima, best.
"	"	" long usual.
"	"	I. and II. mixed.
"	"	Seconds.
"	"	Seconds and thirds mixed.
"	"	Thirds.

WHITE.	<i>Tame</i> , finest quality, cut quill.
"	" Prima, usual.
"	" " ordinary defective tops.
"	Prima, seconds.
"	" seconds and thirds mixed.
FEMINA.	Light colour, good quality.
"	Usual.
"	Half dark.
"	Dark.
BYOKS.	White, with black spots.
BOOS.	Tail feathers, white usual.
"	Light fem.
"	Dark fem.
BLACK.	Long and medium good.
"	Medium and short.
"	Short.
DRAB.	Grey, long and medium.
"	Medium and short.
"	Short.
SPADONES.	White and light fem.
"	Fem.
"	Drab.

ARTIFICIAL BLEACHING.

The value of a black or grey ostrich feather, as compared with a white one of the same size and texture, may be taken, at a rough estimate, to be one fourth or fifth. Formerly light colours, such as sky-blue, pink, straw, &c., could only be produced by dyeing white feathers. But in the year 1871, Messrs. Viol, Dufлот, & Boetzel, feather manufacturers and dyers, of Paris, discovered a chemical process by which they extracted the natural black or grey colour of the ostrich feather, without injuring the *duvet* or plumage, bleaching the feather a dirty white, sufficient, however, to dye the lightest pink or sky-blue upon an originally dark-grey feather, the quill only remaining darkish, so that the connoisseur can still distinguish the difference. For this invention Messrs. Viol took out a patent in Great Britain,

France, Germany, and the United States. Endless lawsuits ensued in the various countries. The patentees appealed, and although they ultimately succeeded in France, they lost their case in Great Britain and Germany. The consequence has been, that the various ostrich feather manufacturers in France—and there are several hundreds in Paris—have to apply to Messrs. Viol for bleached feathers, whilst the English, German, and American manufacturers are free to adopt the process without restraint.

COUNTRIES ADAPTED FOR OSTRICH-FARMING.

From the examples already given of successful acclimatisation out of Africa, it is evident that ostrich-farming may be pursued with success elsewhere than in the bird's native land. Countries and colonies in temperate latitudes, having dry barren waste lands, afford facilities in this respect to those who are sufficiently enterprising to import male and female birds. The southern provinces of Russia, Portugal, Spain, Italy, and Greece, Western Australia, New South Wales, and Queensland, Persia, the Ottoman Empire, and the northern parts of British India, the Brazils, and some parts of South America and of the Southern United States, offer to a great extent many of the conditions which experience has shown to be requisite for breeding and successfully domesticating this giant bird.

REPORT FROM SOUTH AUSTRALIA, WIMMERA DISTRICT, VICTORIA.

The acclimatisation of the African ostrich in Australia, as attempted by the Zoological and Acclimatisation Society of Victoria, has not, up to the present time,

proved very successful; but whether caused by want of knowledge of the habits of the species, and of the best mode of management, or whether the climate be unsuitable, yet remains to be proved. The first importation of birds, five in number, not being found to increase at the Royal Park, it was determined by the Council of the Acclimatisation Society to send them to the Wimmera, which was considered a more suitable climate than that of Melbourne; and there they were placed under the care of Mr. Samuel Wilson. With the limited information which he could gather as to the best mode of management, he endeavoured, with some success, to increase their numbers, and obtained from them at various times a quantity of very good feathers.

In 1873 he reported to the Society as follows:¹—“Of the original importation, two were males and three females; of the females, one proved barren. The first summer two of the females had nests. These were simply a natural hollow in the ground, trampled into a saucer-shaped nest about six feet in diameter. There was no attempt made to collect grass or any kind of rubbish to line the nest with. One of them was on hard clay soil, and had about ten eggs in it; the other contained thirteen eggs. Unfortunately, heavy rains came and flooded the nest which was on clay soil, and, although the water soon disappeared, the eggs were afterwards found to be addled. Out of the other nest twelve young ostriches were hatched, which were carefully attended to by the parent bird, and all of which lived and grew to a large size. The ostrich, contrary to the received opinion, hatches its eggs by sitting on

¹ “Proceedings of the Zoological and Acclimatisation Society of Victoria,” vol. ii. p. 205 (1873).

them, in the same way as most other birds. Both are seldom absent from the nest at any time; the male sits even more closely than the female, and takes rather more than his share of the parental duties. While the eggs are being deposited in the nest, and during incubation, he is exceedingly pugnacious, and an enraged male ostrich is about as formidable-looking an animal as one would care to meet. The second year only one nest was made, and the selection of the place was so unfavourable, that rain filled the nest and spoiled the eggs, preventing increase for that year. Various accidents occurred to the birds, causing losses. One got killed by running against a fence when an attempt was made to drive them into a yard; one died from rheumatism, and several from cold in winter. In the third season two nests were made, and a number of birds were hatched in one of them, but they all disappeared, and were found with their heads eaten off: it was supposed that native cats had killed them. During the summer just ended (1872) two nests were made, and a number of birds were hatched, which were taken away from their parents, housed, and fed, and of these only three are now alive. Of two sent to the Royal Park of this year's birds, one died from rheumatism. One of the old birds got hurt in a wire fence, and died; one strayed away, and was supposed to have been killed for the feathers: a reward of £10 was offered unsuccessfully for such information as would lead to the offender being punished. The number now left is fourteen in all, including one at the Royal Park; only one of the originally imported birds being left.

* * * * *

“The taking of the feathers,” he adds, “is rather hard

work. To effect this object, I had a strong yard made, with a smaller one leading out of it to a narrow lane or crush-pen. The ostriches were accustomed to the large yard by being fed in it every day. When wanted, they were driven into the crush and the gates closed. On one occasion, after trying for a great part of a day to drive them from the yard into the crush-pen without success, and being about to give it up, a little terrier happened to come into the yard, and immediately the birds ran into the pen in the greatest alarm. The plucking is done from a platform outside the pen, on which the operator stands. The wing is caught by one hand and the ripe feathers pulled by the other. A man assists by keeping the bird up to the place where it is wanted, and preventing its turning. They never attempt to peck with their beak, and the long snake-like neck winds under the arms and round the neck of the operator in a somewhat alarming way while the work is going on. It is very rough work to handle them, and bruised hands, arms, and fingers, are generally exhibited after a day's ostrich-plucking. As only a few feathers are taken from each, the bird does not suffer much from cold in consequence.

“The only feathers of any great value are the large feathers of the wing, of which there are about twelve in each. These should be taken before they are quite matured, or the delicate plumage gets worn and scanty; if too soon taken, they are not fully developed, and are of less value. Their growth should be watched, so as to get them at their best, but I could not manage this well, as the birds, from not being fed regularly, got too wild, and could not be got into the yard except after a month's feeding, and some of them have seldom or

never been plucked, and cannot be got to enter the yard.

* * * * *

“The feathers from the ostriches on the Wimmera,” says Mr. Wilson, “have been sold for high prices at various times, and large numbers have been obtained and forwarded to the Council of the Acclimatisation Society; but the greater part of them have, I regret to say, been of little value from being left too long on the birds, owing to the great difficulty of getting them decoyed into the yard. The pugnacious habits of the bird render its complete domestication a matter of some risk and of considerable difficulty. I would recommend that some of the selectors be encouraged to attempt ostrich-farming, and with this object a few might be sold at a moderate price. Their personal care and attention would probably lead to a more complete domestication of the bird than has been possible under my care.”

Mr. Wilson thus concludes:—“I cannot say that I am very sanguine as to ostrich-culture proving a successful or remunerative pursuit. There is, however, little difficulty in keeping these birds within enclosures, as a two-rail fence will generally prove sufficient to prevent their straying; their pugnacious habits, and the difficulty of guarding them when required, are the great obstacles to their successful management. With care, no doubt, these obstacles can be lessened or overcome. If the bird could be established in the interior of the continent, I have no doubt that it would increase rapidly, and become as numerous as it is in those parts of Africa where it is found in a wild state. Many parts of the interior would, I think, be better suited to this bird than Longerengong. Probably the sandy heaths of

the Lower Wimmera around Lake Hindmarsh, or the arid plains on the Darling or Cooper's Creek, where the emu abounds, would be found more like its native haunts, and better suited to the habits of the bird."

IMPROVEMENT OF STOCK.

On glancing at the table given on page 224, it will be seen that, as regards quality, ostrich feathers from the Cape stand sixth on the class list, their plumage being thinner and poorer than that of the five sorts, which take precedence.

It occurred to the writer that possibly some improvement might be effected by crossing Cape birds with fresh stock from North Africa, and on making this suggestion to M. Geoffroy St. Hilaire, a great authority in such matters, he replied that it was quite feasible, and that although in all probability the progeny from such a cross would be smaller in size than the South African ostrich, their plumage, he believed, would be superior.

Anxious to put the experiment to the test, the writer accordingly shipped two pair of first-class Barbary birds from Tripoli to Marseilles, and from thence *via* London to the Cape, where they arrived safely in May last. Time will show the value of the experiment, which, it is confidently expected, will be worth repeating.

APPENDIX.

CONSULAR AND OTHER REPORTS.

EGYPT.

IN the absence of Major-General Stanton, C.B., Her Majesty's Consul-General at Alexandria, Mr. Charles A. Cookson, in reply to our inquiries on the subject of the ostrich-feather trade in Egypt, was good enough to inform us, by letter dated 17th July 1875, that the annual value of ostrich feathers exported from Egypt is from £150,000 to £300,000, varying according to the European demand, which again is dependent on the fluctuations of fashion. The feathers are brought to Cairo (the only Egyptian market for them) by merchants from the Soudan, Kordofan, Darfour, and Wadai, and are with difficulty conveyed thence by camels to the Nile. He added that no ostrich feathers come to Egypt from Abyssinia.

M. Eugene Gros, a merchant at Cairo and Paris, for many years connected with the ostrich-feather trade of Egypt, writing from Cairo on the 20th October 1875, states that the annual value of the ostrich-feather trade there is rather difficult to estimate, but may be taken at from two to three hundred thousand pounds. He confirms the consular report that the feathers come from Kordofan, Gezire, Darfour, Baghirmi, Wadai, and the country of Somali. A certain quantity is also received from Arabia. They are brought from the far inland desert by camels to the Nile, and then come up the river in barges. There is no law of any kind here to limit or control the destruction of ostriches; moreover, the desert countries where these birds are shot are not under Egyptian dominion. At Kordofan the Arabs domesticate the ostrich, and there are many ostrich-farms there belonging to the natives. All the eggs, however, are hatched by female ostriches, and the use of incubators is unknown.

Every six months the feathers are pulled out of these tame birds, which, after being completely plucked, have their skins rubbed over with olive oil, to alleviate the irritation which naturally ensues from the operation. The great quantity of short drab feathers which are annually exported from Egypt come from these tame female ostriches, which, to meet the large demand made upon them, are plucked completely bare. It is not possible to state the exact number of tame ostriches in Egypt, because no reliable statistics exist on this head. In the Soudan only—namely, in Kartoum, Kordofan, and Darfour—the inhabitants have taken largely to ostrich-farming, which appears to pay them well. The relative quantity of tame feathers, compared with the wild, cannot be determined either, for the simple reason that both qualities are systematically mixed together before they reach Cairo. From a religious scruple, the Mussulman is averse to the mode of plucking the feathers out of the live bird. He considers it an act of cruelty, and rather prefers to kill the bird. This, of course, tends very much to check the spread of ostrich-farming in Egypt and the adjacent Mohammedan countries. The more humane method of cutting off the feathers close to the skin, and allowing the roots of the quills to fall out by degrees, seems to be unknown in Egypt. The feathers from Arabia come from Téméni, a country situated on the southern borders of Arabia and the Red Sea, and extending from Asia to the Gulf of Aden. Formerly, caravans from Arabia brought feathers to Aleppo, but since the steamers have commenced running to all the Arabian ports, that route has been completely abandoned.

M. F. Goy, one of the principal ostrich-feather merchants in Paris, and for more than thirty years well acquainted with the details of the North African feather trade, has kindly furnished us with the following additional particulars :—

The value of ostrich feathers annually exported from Egypt may be estimated at £250,000, being the average of the last five years, taking into consideration the enhanced value of the article during that period. Cairo is the market for the Egyptian feather trade, and Alexandria the port from whence they are shipped.

The various qualities of feathers which are sold at Cairo come from the African countries south of Egypt, and also from Arabia. The former, however, form by far the most important portion, and are of two qualities, according to their origin—those from *Senaar*, and those from *Kordofan*.

The former are of thick plumage, dry and brilliant, whilst the latter resemble more the graceful Barbary feather in the colour and quality of the plumage. Feathers coming from the neighbourhood of Wadai are often taken for those coming from Kordofan, and being sent towards the west, find their way into the Barbary markets, while those from Darfour frequently follow the same route, and are mixed with consignments from Senaar.

At Kartoum, beyond the sixth cataract of the Nile, entire skins are brought in by the caravans from the desert, and are sold and picked, and then forwarded by the native traders. They are frequently sent as far as Dongolah up the Nile, and from there to Assouan, to Siout, and finally to Cairo. At each of these stations exchange and barter takes place, and the feathers often changing hands many times before they finally reach the European buyer at Cairo. In the meantime, they have been classed and re-classed, sorted and re-sorted, for the purpose of deceiving the buyer as to the real contents and quality of the bundles. These fraudulently-packed parcels are chiefly made up at Siout; and so cleverly is this done, that the inexperienced buyer is often completely victimised.

The feathers from Kordofan, however, sometimes arrive by the caravans from Gellabs, which come direct to the gates of Cairo, without the intervention of the Assioutains. Hitherto all feathers from Kordofan have been procured from wild birds, shot in the desert; but those from Senaar, which, as regards quantity, constitute about two-thirds of all the Egyptian feathers, are mixed with those from domesticated birds, in the proportion of a quarter "wild," to three-quarters "tame." The details of ostrich-farming as practised by the natives of Nubia are as yet almost unknown; but to judge by results, it is evident that the system there adopted does not approach that of the Cape colonists by a long way. The characteristic blemishes in the "tame" feathers, as compared with "wild," are consequently much more apparent in those from Egypt than in those from the Cape. Nevertheless, the better quality of the plumage renders the former superior to the latter.

Arabia formerly furnished three different qualities of ostrich feathers: The "Aleppo," from wild ostriches in the desert of Syria, the most perfect of all in grace, colour, and richness of plumage; the "Hedjaz," which from their form were called "false Aleppo;" and the "Yémen," easily recognisable by their splendid white colour and the poverty of their plumage.

The two first named have become so scarce that they now hardly form an article of trade, while the last named are so inferior in quality that they are difficult to dispose of. The three Arabian qualities are sometimes mixed together by the Arabs, and sent to Cairo by way of Djeddah, and small quantities are occasionally shipped direct to Europe *viâ* Aden, but their value is insignificant compared with the quantities forwarded to Cairo. There is no place in or near Abyssinia from whence feathers are sent, and, so far as can be ascertained, none are brought from that country. The feathers from Alexandria are shipped by steamers direct either to Marseilles or to Southampton.

B A R B A R Y.

To the courtesy of Mr. F. R. Drummond Hay, H.M. Consul-General at Tripoli, we are indebted for the following communication, dated Tripoli, 18th August 1875 :—

“Ostrich feathers are brought to market at this port from Timbuctoo, Housa, Bornou, and Wadai ; those from Timbuctoo being considered the finest. The feathers from the three former regions are brought to Ghadames, by the agents of Ghadamseen merchants, and thence to Tripoli by the merchants themselves. Those from Wadai are brought here *viâ* Fezzan, and sometimes Bengazi, by Tripoli traders.

“The total annual value of ostrich feathers exported from Tripoli is about £100,000, and they are shipped chiefly for London and Paris. Those from Housa are brought here to Tripoli and sold by the skin, then plucked and sorted into bundles, according to quality, by the exporters. Feathers from other parts of the interior are generally brought down and sold in bulk, and sorted before exportation. No feathers from tame birds are exported from Tripoli, nor are any exported from Tunis. The Ghadamseen merchants, who monopolise nearly the whole of the feather trade of the surrounding regions, prefer Tripoli as a market for their goods, as being much nearer to Ghadames than Tunis, whilst at the same time the route is safer. It would not be difficult to obtain live ostriches from the interior for exportation to Europe or elsewhere for the purposes of acclimatisation.”

ALGERIA.

Lieutenant-Colonel Playfair, H.M. Consul-General at Algiers, writing to us under date 12th July 1875, has most obligingly reported as follows:—"Ostriches were once very common in Algeria. The early travellers, about the middle and end of the last century, used to hunt them, even north of Batna, in the high plateaux; but at the time of the French conquest they were confined to the Sahara, though very plentiful there. General Marguerite, the prince of Algerian hunters, who was killed at Sedan, did more perhaps than any one else to cause their extinction. He, and all the French officers stationed in the Sahara, hunted them to such an extent, that now they have ceased to exist in French Algeria. A few feathers are occasionally brought from the remote oases in the desert, such as El-Goléa, Insallah, &c., but they are very few indeed, and even these are brought rather as presents to the French military commandants, than for sale. Ostrich eggs are much sought after to make fancy articles for the English tourists who come here in winter. They are brought in by the Arabs from great distances; but their number is decreasing yearly, and the price is augmenting. There are districts in the far interior where the bird still exists, but where chasseurs are few; and hence the eggs only are brought in."

To the foregoing particulars we may add, that an English lady, the wife of a French advocate at Algiers, has lately commenced ostrich-farming in the vicinity of the town; and a French officer, Commander Crépu, at Daja, in the province of Oran, has likewise turned his attention to the subject with some success.

MOGADOR.

His Excellency Sir John Hay Drummond Hay, K.C.B., H.M. Plenipotentiary at Tangiers, courteously replying to our application for information concerning the ostrich-feather trade of Morocco, wrote in September 1875 as follows:—"As ostrich feathers are not exported from Tangiers, being the northern port of Morocco, I have sent your letter to my son, who is H.M. Consul at Morocco, whence ostrich feathers are exported, and I have requested him

to reply to the queries you have put me, and to lose no time in transmitting to you the required information."

In due course we received from Mr. R. Drummond Hay, H.M. Consul at Mogador, the following report, dated 15th September 1875 :—

"I have much pleasure in furnishing the information required respecting the ostrich-feather trade between this country and the Soudan.

"The annual value of ostrich feathers shipped from the port of Mogador averages £20,000 sterling, of which seven-eighths are sent to London, and the remainder to France.

"Approximate weight, 60 cwt.

"The ostrich-hunters on the confines of the Sahara or Great Desert bring the feathers for sale to the markets of Tindoof, Teezoon, and Wadnor, where they are bought, either by weight or 'so much per parcel,' by traders between the above-mentioned towns and Mogador. On arrival at Mogador, they are again sold to resident merchants by weight, sorted, packed, and shipped to Europe."

The comparatively small exportation from Morocco, amounting, as above stated, to £20,000, being one-fifth of the value of exports from Barbary, and one-seventh of that from the Cape (putting the value of the export of wild feathers from South Africa at £140,000 per annum), is very remarkable, and tends to prove that there are only three important ostrich-feather markets in Africa, namely, Cairo and Tripoli in the north, and Port Elizabeth (with Cape Town) in the South.

SENEGAL.

To M. le Commandant Chaumont, Chef d'état major du Gouverneur at Saint Louis, the capital of French Senegal, we are indebted for the following interesting particulars, obligingly communicated by him, 10th August 1875 :—

"His Excellency the Governor, Colonel Vallière, having quitted the colony on leave of absence, I have great pleasure in sending you the information required on the subject of ostrich feathers from this colony.

"In 1874 the export of feathers from Senegal amounted to 61,000 francs (£2500), and I believe about the same amount will be exported this year (1875). They are generally shipped to Bordeaux by the steamers of the *Messageries Maritimes*. All the feathers come from Soudan in Senegal, namely, from a country situated between 11° and 18° N. latitude and 10° to 18° W. longitude.

"The birds are found in the countries near the Senegal River in the far interior, where they are hunted by the natives, who also gather the eggs. Should any of the latter be found to be partially incubated, they are carefully brought home and hatched out artificially, the young being reared by hand, and eventually becoming quite domesticated.

"The feathers are sold or bartered at this port, as well as at other places in this settlement."

AN ACT FOR THE PRESERVATION OF WILD OSTRICHES IN THE CAPE COLONY,—MAY 1870.

Whereas it is expedient to prevent the indiscriminate destruction of wild ostriches in this colony: Be it therefore enacted by the Governor of the Cape of Good Hope, with the advice and consent of the Legislative Council and House of Assembly thereof, as follows:—

I. The proclamation dated 21st March 1822, intituled "Game Law Proclamation," in so far as the same relates to the protection of ostriches or the eggs of ostriches, is hereby repealed.

Proclamation
21st March 1822,
repealed.

II. No person shall kill, catch, capture, hunt, or wound any ostrich, not being domesticated, without having first obtained a licence to kill ostriches, under a penalty of any sum not less than thirty pounds sterling, and not exceeding fifty pounds sterling, for the first offence, and not less than forty pounds sterling, and not exceeding one hundred pounds sterling, for every subsequent offence; and any person convicted under this section within six months from the time of the offence may be imprisoned, with or without hard labour, for any term not exceeding six months, unless or until the fine be sooner paid.

Penalty for kill-
ing, &c., wild
ostriches with-
out a licence.

Like penalty
for killing, &c.,
ostriches during
fence season.

III. No person shall, whether having obtained a licence to kill ostriches or not, kill, catch, capture, hurt, or wound, within any district of this colony, any ostrich, not being domesticated, within the months which shall in any such district be for the time being proclaimed as fence season for ostriches under the provisions of this Act, under like penalties as by the last foregoing section are provided in cases falling within that section.

Stamp duty on
and duration of
licence.

IV. For every licence to kill ostriches there shall be payable a stamp duty of twenty pounds sterling; and every such licence shall be in force for the time specified therein, and no longer. Provided that every licence to kill ostriches shall authorise the holder thereof to catch, capture, hunt, or shoot at the same.

Governor to
proclaim fence
season.

V. It shall be lawful for the Governor, by proclamation to be by him issued, to fix and prescribe for the several districts in this colony the close time or fence seasons, within which it shall not be lawful to kill, catch, capture, hunt, or wound ostriches within this colony, not being domesticated ostriches, either with or without a licence to kill ostriches.

Penalty for
disturbing, &c.,
eggs of wild
ostriches.

VI. No person shall at any time wilfully take away, disturb, destroy, or have in his possession, the eggs of any wild ostrich in any part of this colony, under the penalty of any sum not exceeding three pounds sterling for the first offence, and not less than three pounds sterling, nor exceeding six pounds sterling, for every subsequent offence, the conviction in each case being within six months from the time of the offence charged; and any person convicted under this section may be imprisoned, with or without hard labour, for any term not exceeding three months, unless the fine be sooner paid.

Owner or
occupier of land
allowed to catch
young ostriches
for domestica-
tion.

VII. It shall be lawful for any owner or occupier of land, without having taken out any licence, to catch and keep, or to cause or permit to be caught and kept, the young of any ostriches for the purposes of domestication, at any time when the same shall be found upon the land of such owner or occupier, anything contained in this Act or any other law to the contrary notwithstanding.

VIII. The several fines above mentioned may be recovered by any person, on behalf as well of himself as of the Crown, in all cases where the fine shall not exceed fifty pounds sterling, in the Court of the Resident Magistrate of the district where the offence may have been committed; the sentence, however, being subject to review by the Supreme or Eastern Districts or Circuit Courts, as the case may be, and in other cases in the Supreme Court, the Court of the Eastern Districts, as the case may be, or the Circuit Court for the district where the offence may have been committed; and a portion of any fine imposed upon any offender on conviction for contravening any of the provisions of this Act, not less than one pound nor exceeding five pounds, at the discretion of the Court, shall be paid to the person on whose information such conviction shall have taken place, provided such person be not an accessory.

Fines, by whom and how recoverable.

Portion of fine to be paid to informer.

IX. It shall be lawful for the Governor, by proclamation in the "Government Gazette," to proclaim and declare, as to any parts of this colony, that wild ostriches shall be protected and not destroyed for any number of years not exceeding three, to be mentioned in such proclamation; and any person contravening the provisions of any such proclamation shall be subject to the like penalties as those provided by the second section of this Act; and it shall also be lawful for the Governor from time to time to revoke, alter, or amend such proclamation.

Ostriches may be protected for certain number of years.

X. In any prosecution for infringement of the second section of this Act, it shall be *prima facie* sufficient for the prosecutor to show that the accused does not appear as the holder of a licence in the list of persons to whom the requisite licence in such case shall have been issued, respectively kept in the office of the Resident Magistrate before whom or in whose district such case shall be brought for trial in any Court; but it shall be lawful for such accused person to rebut such evidence by proof that he was, in fact, at the time of the commission of the offence charged, the lawful holder of such licence.

Absence of name from list of licences *prima facie* proof of non-issue of licence.

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THE END.

p9/34 size of Imm. $5\frac{1}{4}$ to $6\frac{1}{4}$

135 Female Imm makes a booming sound.

135. Imm pair strictly. Males sit on the eggs

141 Imm exclusively herbivorous.

143 } food of young Imm.

149 }

174 Imm lay in Jan^r - 2 Feb^r

162 Separation

136 Egg $5\frac{3}{4}$ " to $3\frac{3}{4}$ "

138 size of Imm's eggs $6 \times 3\frac{1}{2}$

169 weight of Imm's Eggs $1\frac{1}{2}$ lbs

158 1 lb 2 $\frac{1}{2}$ oz to 1 lb 7 oz

173 Conclusions -

Imm 131 to 174 --- 141 to 143 --- 147 to 174

129 Kick of Imm a Canoway.

201 Bone Dust ($\frac{1}{4}$ lb sulphur to 2 buckets of
crushed bones with salt)

Nov. 1880

From 1887 egg $1\frac{1}{2} \times 1\frac{1}{2}$ to $1\frac{1}{2} \times 1\frac{1}{2}$ inches $12\frac{1}{2}$ long | length $6 \times 3\frac{3}{8}$

From egg of Imm. 1 lb 10 oz $5\frac{3}{4}$ long $3\frac{3}{4}$ diam 1882
Average weight of egg at From 1882 1 lb 8.425

57 Food of Rheas roots & grass

62 } Food of Rheas.
78 }

80 Rheas left out after February

80 Cook the larger bird.

79 One Cook to 2 hen Rheas.

80-83 Rheas breeding.

Rheas food - boiled potatoes -

85-92 1/2 day in Rheas (mostly potatoes)

88 - - - - -

89 - - - - -

90 - - - - -

91 - - - - -

92 - - - - -

76 - - - - -

77 - - - - -

78 - - - - -

79 - - - - -

Actual period of incubation of 42 days

Actual egg as found full of water weighed 4lb 0¹/₂ oz
shell empty weighed 11⁰/₈ oz // 17 in x 18 in circumference
as 42 weight 30 lb

Alp. L. 181

2000 ft. deep 181

weight 14 lbs

4.75 long
2.75 wide

89

Example continued & worked out

$$\begin{array}{r} 277.274 \\ 21 \\ \hline 277.274 \\ 5545.48 \\ \hline 5822.754 \end{array}$$

$$\begin{array}{r} 32 \\ 22 \\ \hline 704 \\ 5.68 \\ \hline 2272 \\ 39760 \\ \hline 3998.72 \\ 4.12 \end{array}$$

$$V = \frac{4\pi}{3} D d^2$$

$$= 4.1888 D d^2$$

$$\begin{array}{r} 799744 \\ 399872 \\ \hline 1599488 \\ \hline 164747264 \\ 4.12 \end{array}$$

$$\begin{array}{r} 329494528 \\ 164747264 \\ \hline 658989056 \end{array}$$

$$\underline{\underline{67875872768}}$$

$$\begin{array}{r} 5822.754 / 67875.872768 \text{ (11.85 pints)} \\ 5822754 \\ \hline 9648332 \\ 5822754 \\ \hline 38255787 \\ 34936524 \\ \hline 33192636 \\ 29113720 \\ \hline \end{array}$$

= 11 $\frac{2}{3}$ pints nearly

One gallon = 8 pints weigh 10 lbs

Contents in cubic in
 Larger internal diameter 11.49
 Shorter — — — — 8.37

To find the amount of water contained by an Egg -

The Egg is assumed to be a prolate spheroid - one obtained by revolving an ellipse about its major axis: ~~and in this case~~ only the longer & shorter diameters need be measured: and if these be for the outside, $2a$ and $2c$ while θ is the thickness of the shell the internal content is

$$\pi = 3.1416 = \frac{22}{7}$$

$$V = \frac{4\pi}{3} (a - \theta)(c - \theta)^2$$

and 8 pints occupy 277.274 cub in so that the number of pints is

$$N = \frac{8V}{277.274}$$

$$= \frac{32\pi}{3} \frac{(a - \theta)(c - \theta)^2}{277.274}$$

Example - Longer diameter 11.62
 Shorter diameter 8.5
 Thickness of shell .13

$$a = \frac{11.62}{2} = 5.81$$

$$c = \frac{8.5}{2} = 4.25$$

$$\theta = .13$$

$$\text{so that } a - \theta = 5.68$$

$$c - \theta = 4.12 \text{ and therefore}$$

$$N = \frac{32 \times \pi \times 5.68 \times 4.12 \times 4.12}{3 \times 7 \times 277.274}$$

Ostrich Egg (smooth shell) (Floore)

weighs when empty (the shell alone) $11^{\text{oz}} 8^{\text{drms}}$

When full of water it weighs $4^{\text{lb}} 5^{\text{oz}} 8^{\text{drms}}$

It contains therefore; weight of water $3^{\text{lb}} 5^{\text{oz}}$

by calculation taking the thickness of shell at .05 and the longer diameter at 6.35 -
shorter -- do at 5.40

(Longer circumference at 18.50)
(shorter do at 16.96)

The content in cub inches will be

$$\begin{aligned} & .5236 (6.35 - .05) (5.40 - .05)^2 \\ & = 94.4164683 \text{ cub inches} \\ & \quad \text{the } 10361 \\ & \quad \underline{3.4084345} \\ & \quad \underline{16336} \\ & \quad \underline{4} \\ & \quad 6.53 \end{aligned} \quad \left(\begin{array}{l} \text{1 cub inch of water} \\ \text{weighs .0361 lbs} \end{array} \right)$$

$$\begin{array}{l} \text{Content } 94.41 \text{ cub inches} \\ \text{weight of water } 3^{\text{lb}} 6^{\text{oz}} \frac{1}{2} \end{array}$$

Taking the thickness of shell at .06

The contents would be $93.91^{\text{cub in}}$
and weight of water $3^{\text{lb}} 6^{\text{oz}} \frac{1}{4}$

The egg is probably not quite symmetrical
(not a perfect prolate spheroid)



Alpyornis Egg (Floored)

weight of shell	2 ^{lb} 13 ^{oz} 0 ^{dr}
full of water	15 ^{lb} 12 ^{oz} 0
weight of water	12 ^{lb} 15 ^{oz} 0

10¹/₃ (10.32) pints (207^{oz})

Thickness of shell at 11

Longer diameter	11 ⁱⁿ 8
shorter diameter	7 ⁱⁿ 9
Longer circumference	31 ⁱⁿ 25
shorter circumference	24 ⁱⁿ 8

by calculation
(shell at 11) 357.683 ^{cu. inches} = 12^{lb} 14^{oz} 8^{dr}
10.32 ^{pints} = 10¹/₃ pint

shell at 13 = 10¹/₃ ^{pints} weight of water 12^{lb} 11^{oz} 1^{dr}
weight of shell taken

E. Gorman egg 1900 to 22 Rose Feb 20 1910
32¹/₄ — 27¹/₂

282. weight of Gorman 1900 — { 862 — 707^{mm}
33.93 — 27ⁱⁿ 63

Apyrosius Egg

Cast of (after the moulded one at
the British Museum)

Longer diameter 13ⁱⁿ.5

Shorter diameter 9ⁱⁿ.4

Longer circumference 36.5

Shorter circumference 30.5

$35 \frac{9}{10}$
 $27 \frac{6}{10}$

(Thickness of real shell taken at .13)

Weight of shell taken at 4th of 9th

Contents 615^{cub in}.08

Weight of water contained 22^{lbs}.2
= 22^{lbs}.3^{oz}.3.2
4 9

Total weight = 26^{lbs}.12^{oz}.3.2

contains 17^{pints}.76 (17³/₄ pints)

Egg largest at stem?

June 1902

27 ⁶/₁₀

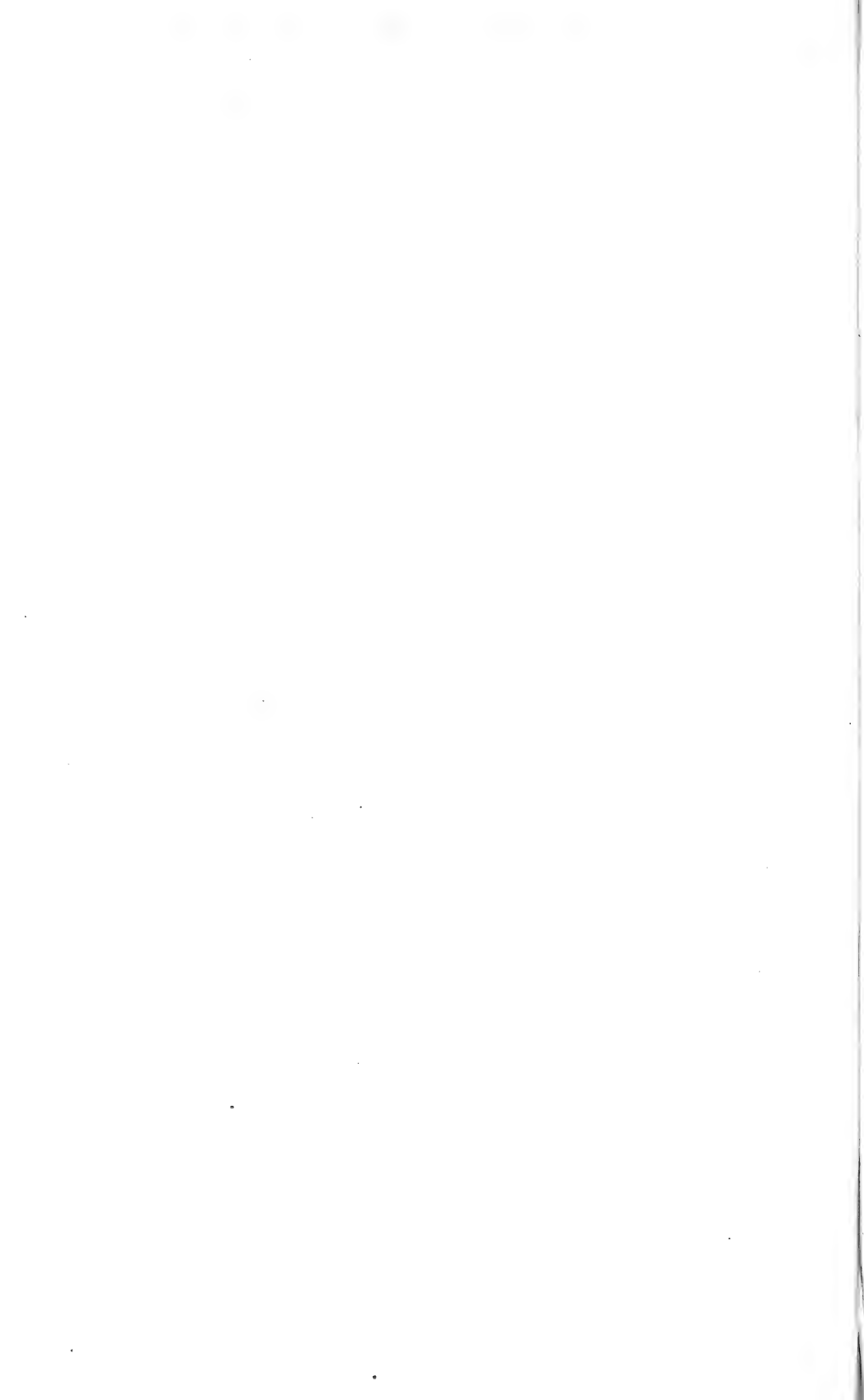
32 ²/₁₀

21

22

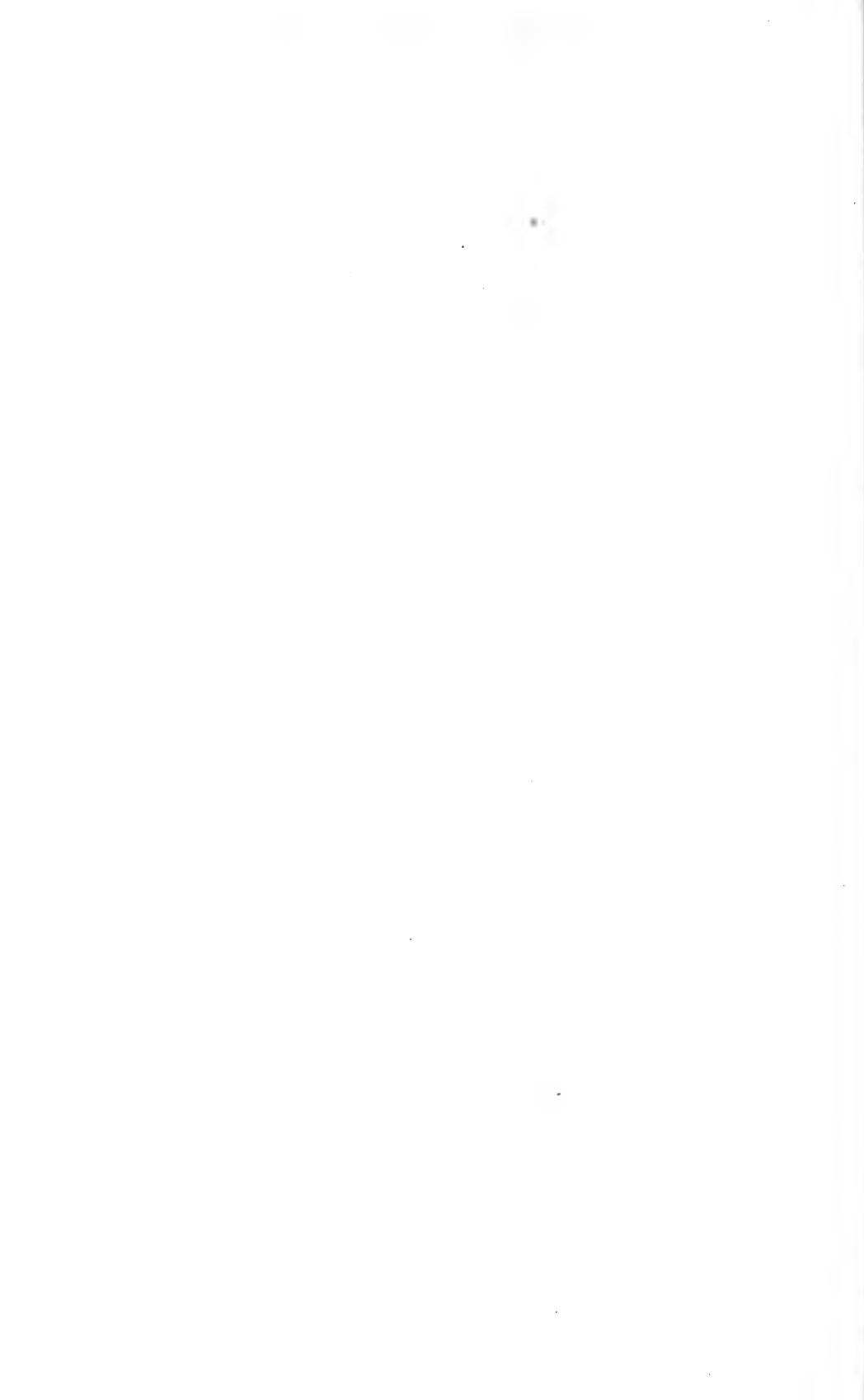
Rough Ostrich Egg (Floors)

Shell - ——— lb 9^{oz} 13^{drum}
full of water - - - - 3^{lb} - 6^{oz} 0
weight of water contained 2^{lb} 12^{oz} 3^{drum}



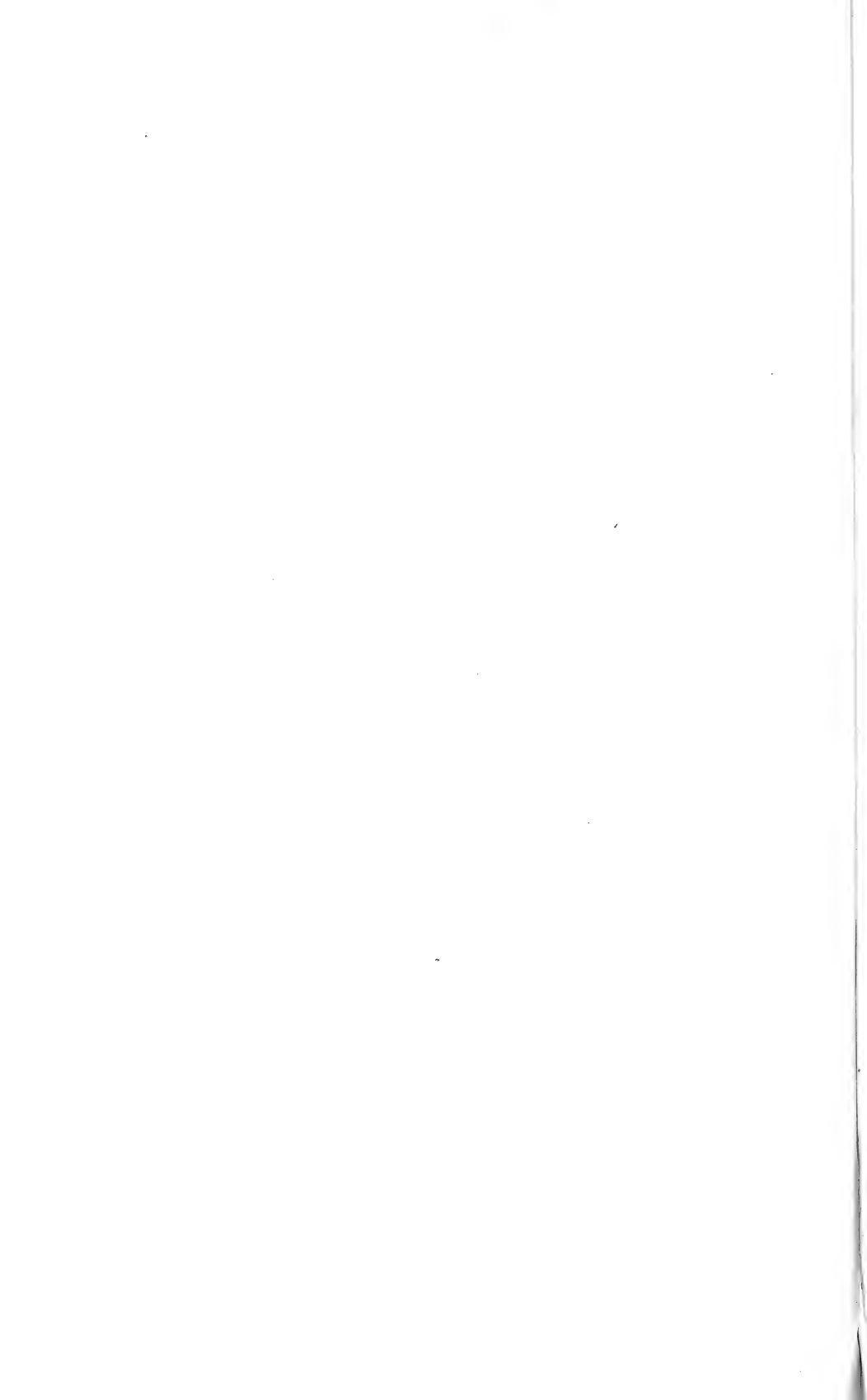
Rhea - (Flown)
Egg from Castle Orr

Shell -	3 ⁰³ 1 ^{dr}
full of water -	1 ^{lb} 6 ^{oz} 12 ^{dr}
weight of water contained	1 ^{lb} 3 ^{oz} 16 ^{dr}
Contains ^{pint} .984	



Emu Eggs (Floors)

Shell - - - - -	3 ⁰³	9 ⁰⁰
full of water -	1 ⁰⁶	7 ⁰³ 12 ⁰⁰
weight of water contained	1 ⁰⁶	4 ⁰³ 3 ⁰⁰
Contents - 1 ⁰⁸ ^{point}		



Alpyornis Egg. Roy. Old Surgeons

Longer diameter 11.62 (295^{mm}) 3.543

Shorter diameter 8.6 (217^{mm}) 2.650

Longer circumference 32.0 (812^{mm}) 31.416

Shorter circumference 26.87 (682^{mm}) 26.850

Thickness of shell taken as $.11$

Contains 11.89 ^{pint}

contains 411.836 ^{cu. in.}

contains (weight of water) 14.8672 ^{lb}

weight of shell taken as $3.15 = 3.206$ ^{oz}
 $\frac{14.867}{18.019}$

Total weight of Egg full of water 18lbs.

Myersville Sep 20th 1898
Cavens Feb 12 1898
Short circumference 27"
Long - - 31"

- $$\left. \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \end{array} \right\}$$

Maas se noch nicht veröffentlicht.

7

622 12

7000 1000 1000

